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Marine Fisheries REVIEW

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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Marine Fisheries REVIEW

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FRONT COVER: Beach seine's large catch will be dried on Ceylon beach.

(FAO photo)

FISHERMEN'S MEMORIAL - GLOUCESTER, MASS.

U.S. DEPARTMENT OF COMMERCE
Frederick B. Dent, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

National Marine Fisheries Service
Philip M. Roedel, Director

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this pericdical has been approved by the Director of the Office of Management and Budget through May 31, 1973.

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NOAA CREATES MARINE ADVISORY SERVICE

NOAA has set up a Marine Advisory Service (MAS) to bring information on the use of marine resources straight to people who need it.

Dr. Robert M. White, NOAA Administrator, said:

"The NOAA Marine Advisory Service will link the findings of scientists and engineers to all who seek livelihood or recreation from the sea. We are building upon the successful 60-year tradition of the agricultural extension service, linking colleges and universities to users at the grassroots level.

"A most important element will be feedback from users to researchers--taking user needs back to the scientists, engineers, and managers for solution."

An important component of the new service already exists--the Sea Grant Advisory programs on every salt water coast and the Great Lakes. Howard H. Eckles has been appointed Acting Program Manager of the service. Formerly, he was NOAA's Assistant Associate Administrator for Marine Resources.

What Will Be Emphasized

The national program will strengthen areas now emphasized by NOAA: commercial and sports fishing, seafood processing and marketing, coastal zone management, marine recreation, and marine science education for the general public. Emerging areas of emphasis include aquaculture, marine mining, and maritime transportation and port development.

Mr. Eckles explained: "The key to the program is advisory work at the local level. We want to increase the effectiveness of the marine advisory agents who walk the waterfront and work with fishermen, planners, method processors, marina operators, and the like. We will emphasize meeting the needs of our field agents and their clientele, not building an administrative staff in Washington. The example and experience of the successful university-based Sea Grant marine advisory programs and the National Fisheries Service extension efforts will be fully used."

MAS staff will designate marine advisory lead units mainly at colleges and universities. They will help to create programs in coastal states and brief regional marine advisory personnel. The first briefing was held in Portland, Oregon, January 23-24, 1973.

All NOAA Involved

NOAA technical staff may appear at workshops to help solve problems posed by users. They will participate in local advisory projects. Each NOAA component has designated a staff member to act as marine advisory specialist at headquarters. NOAA personnel at laboratories and field installations throughout the United States have been designated MAS representatives. They are responsible for disseminating information on NOAA products and services to local marine advisory units; they arrange for technical help when asked.

RECENT LEGISLATION AFFECTING FISHERIES AND THE MARINE ENVIRONMENT

Kip Robinson

The 92nd Congress (1971-1972) produced considerable legislation of interest to fishermen and others concerned with the marine environment. Several Federal Departments and Agencies were given new or expanded responsibilities covering numerous environmental issues. A number of the more significant of these laws are discussed here, without attempting any legal analysis, and a listing of some others follows.

"The Federal Boat Safety Act of 1971"--P.L. 92-75, Aug. 10, 1971

This Act authorizes the issuance of regulations and standards by the Coast Guard for the manufacture and safe operation of recreational boats, approval of State boating safety programs, and the making of grants-in-aid to States to carry out boating safety programs. The Act also authorizes appointment of a National Boating Safety Council.

"The Farm Credit Act of 1971" -- P.L. 92-181, Dec. 10, 1971

This Act permits qualified fishermen to borrow money from the Farm Credit System for several purposes --including housing financing, if a rural resident, or for general business operations, which could include equipment and family living requirements. In addition, eligible fishery cooperatives and persons furnishing fishing operation-related services to fishermen may also borrow money through the Farm Credit System. The Farm Credit Administration, an independent Federal Agency, is responsible for supervising the programs authorized by this law.

A reprint of an article about this Act in question-and-answer form can be obtained from its author: Dr. Fred Olson, NMFS Economics Research Laboratory, 7338 Baltimore Ave., College Park, Maryland 20740.

P.L. 92-219, Dec. 23, 1971

This Act amends the Fishermen's Protective Act of 1967 to discourage foreign countries from allowing their fishermen to conduct operations that could diminish the effectiveness of international fishery conservation programs. To accomplish this objective, the President is granted authority to prohibit importation of fishery products from a country that permits such fishing operations.

P.L. 92-402, Aug. 22, 1972

This Act authorizes the Secretary of Commerce to transfer certain surplus Liberty Ships to the States for use as offshore artificial reefs for the conservation of marine life. The States that wish to use those ships for artificial reefs must receive permission in advance from the Secretary for each such usage, and must agree to certain terms and regulations.

"The Federal Water Pollution Control Act Amendments of 1972"-- P.L. 92-500, Oct. 18, 1972

This Act institutes a major change in the enforcement mechanism of the Federal water pollution control program --from setting standards for water quality to controlling discharges into U.S. waters. The legislation is directed at a zero discharge of pollutants into U.S. waters by 1977, following a far-reaching program of technological and economic research. It vests responsibility for overseeing the issuance of discharge permits in the Environmental Protection Agency (EPA).

P.L. 92-504, Oct. 18, 1972

This Act amends the Sockeye Salmon or Pink Salmon Fishing Act of 1947. It authorizes the U.S. to provide funds for the restoration and extension of the sockeye and pink salmon runs in the Fraser River System. By agree-

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ment, Canada will provide equal funds for the same program. The funds will be administered by the International Pacific Salmon Fisheries Commission over a 16-year period.

"The Federal Ship Financing Act of 1972"--P.L. 92-507, Oct. 19, 1972

This Act seeks to simplify procedures for obtaining vessel mortgage guarantees and to better meet current industry needs for investment capital. It provides major refinancing authority to make additional money available for modernization and expansion of the U.S. domestic fishing fleet.

"The Marine Mammal Protection Act of 1972"--P.L. 92-522, Oct. 21, 1972

It sets U.S. guidelines for conservation of marine mammals. The Secretary of Commerce will administer parts of the Act concerning whales, porpoises, seals, and sea lions; the Secretary of the Interior those concerning sea otters, walruses, manatees, and polar bears. With certain exceptions, it prohibits the taking and importation of these animals. A permit system will be used to maintain control over the exceptions allowed. A wide range of responsibilities are assigned to the two Secretaries, including issuing regulations, conducting scientific and technological research, carrying out enforcement and surveillance activities, and entering into cooperative arrangements with the States and conservation groups.

"The Marine Protection, Research, and Sanctuaries Act of 1972" (the "Ocean Dumping Act")--P.L. 92-532, Oct. 23, 1972

This Act authorizes issuances of regulations on the transportation of material intended for dumping into the oceans or waters under U.S. jurisdiction, as well as regulations on the actual dumping of material into such waters. Both the Administrator of the Environmental Protection Agency and the Secretary of the Army are empowered to issue permits for transportation or dumping. The Secretary of Commerce has primary responsibility for programs of research involving the effects of ocean dumping and the long-range effects of pollution, overfishing, and man-induced changes of the ocean environment. In addition, he is responsible for the designation of marine sanctuaries to protect valuable coastal and offshore areas.

P.L. 92-569, Oct 26, 1972; P.L. 92-594, Oct 27, 1972

These Acts amend the Fishermen's Protective Act of 1967 with respect to reimbursement to owners of U.S. fishing vessels illegally seized by foreign countries. Reimbursement for fines, license fees, or other such charges will be expedited, and provisions for seeking collection of such reimbursed amounts are strengthened. P.L. 92-594 continues until 1977 the provisions of the section for reimbursement of certain losses and costs other than fines, license fees, or other such charges.

"The Coastal Zone Management Act of 1972"--P.L. 92-583, Oct. 27, 1972

It establishes a national policy and initiates a national program for the wise use and protection of the Nation's coastal zones. The Commerce Department is given the lead role in carrying out the Act. Commerce will cooperate with other Federal agencies and the States to develop new programs governing the uses of the coastal zone.

P.L. 92-590, Oct. 27, 1972

This Act extends the provisions of the Commercial Fisheries Research and Development Act of 1964, as amended. It is designed to continue the development of conservation measures through coordinated State-Federal efforts directed at the Nation's commercial fishery resources. This extension authorizes Federal financial assistance to State efforts for five more years. It also increases the authorization of disaster funds.

P.L. 92-601, Oct. 27, 1972

This Act prohibits the use of certain foreign-built small boats (less than five net tons) in U.S. fisheries for a five-year period. The effect of the bill would be that small fishing boats that have been prohibited from use in a fishery of a foreign nation would not be permitted to enter a similar fishery in the United States.

P.L. 92-63, Aug. 4, 1971-- "The Vessel Bridge-to-Bridge Radiotelephone Act."

P.L. 92-87, Aug. 11, 1971-- Amends the Northwest Atlantic Fisheries Act of 1950, as amended.

P.L. 92-125, Aug. 16, 1971 -- Establishes the National Advisory Committee on the Oceans and Atmosphere.

P.L. 92-203, Dec. 18, 1971--"The Alaska Native Claims Settlement Act."

P.L. 92-205, Dec. 18, 1971--"The Weather Modification Reporting Act."

P.L. 92-340, July 10, 1972 -- "The Ports and Waterways Safety Act of 1972."

P.L. 92-444, Sept. 29, 1972--"The Central, Western, and South Pacific Fisheries Development Act."

P.L. 92-471, Oct. 9, 1972--Amends the North Pacific Fisheries Act of 1954.

P.L. 92-516, Oct. 21, 1972--"The Federal Environmental Pesticide Control Act of 1972."

P.L. 92-604, Oct. 31, 1972--Extends until 1977 the program for control of jellyfish and other such pests in U.S. coastal waters.

NMFS OFFERS NORTH PACIFIC MARINE FISH CHART

NMFS has released the 2nd in a series of 7 four-color posters picturing fish and shellfish in marine and fresh waters.

The newest chart shows 51 selected marine fishes of the North Pacific, Alaska to northern California, and gives both the common and scientific name of each.

The first chart featured North Atlantic marine fishes; others planned will show fish of the Gulf and South Atlantic; the California current and adjacent waters; Hawaii and central Pacific; fresh-water fishes; and shellfish.

These charts, 30 by 48 inches, can be framed and used in schools, libraries, restaurants, and recreation rooms. Available for $1.50 each from the U.S. Superintendent of Documents, GPO, Washington, D.C. 20402.

The charts are developed by Bob E. Finley, Chief, NMFS National Marketing Service Office, Chicago, Illinois.

JAPANESE FISHING VESSELS OFF ALASKA

William R. Dickinson

Each year Japan employs about 700 different ships in her fisheries off Alaska. This fleet lands more than 3 billion pounds of fish, shellfish, and whales. It consists of fishing or catcher vessels and associated support ships, such as processing or factory ships, refrigerated transports, tankers, cargo ships, etc. Included in the fishing vessels are three types of trawlers, salmon and herring gillnetters, longliners, crab boats, and whale catchers. Some fishing vessels are especially designed for operations in the north Pacific and Bering Sea, while many are standard models used worldwide by Japanese fishermen.

The trend in fishing vessels is toward larger units with all or most processing done aboard. Prompt processing or preserving is the keynote in all fisheries, and more Japanese fishing vessels are being designed for these purposes.

Japan is one of the world's foremost fishing nations. It started to exploit the resources off Alaska[1/] in 1930 with a king-crab expedition to the eastern Bering Sea. In 1933, a groundfish fishery was started in the same area and, with the crab fishery, continued until 1941. World War II temporarily halted Japanese fishing.

The Japanese resumed in 1952 with a salmon fishery along the western Aleutian Islands. Fishing was resumed in the eastern Bering Sea in 1953, and extended into the Gulf of Alaska in 1962. The Japanese have continued to expand the fisheries off Alaska by exploring new grounds, seeking and utilizing new species, and employing new fishing methods.

Fishing gear used off Alaska includes trawls, gill nets, longlines, tangle nets, crab pots, and harpoons. Such diverse fishing methods require different types of vessels. The major types are listed in Table 1 for each year during 1952-1970. There are several classes of vessels within each category for each major type of fishery.

TRAWL FISHING OPERATIONS

The Japanese fish with trawls on almost all of the Continental Shelf off Alaska (Fig. 1). This fishery dates back to 1933, when trawling began in the eastern Bering Sea, primarily for yellowfin sole. The primary species sought by the trawlers have been walleye pollock (Theragra chalcogrammus), Pacific ocean perch (genus Sebastodes), herring (Clupea pallasii), shrimp (genus Pandalus), yellowfin sole (Limanda aspera), and other flat fishes.

At first the Japanese sought flat fish. But when fishing resumed after World War II, Pacific ocean perch made up an increasingly larger part of the catch. Although perch landings peaked in 1966, that species is still a primary target for many independent trawlers along the Aleutians and throughout the Gulf of Alaska.

Pollack has replaced flat fish as the primary species sought. It is the bulk of the Japanese trawl catch off Alaska. The fish is used mostly for minced fish (surimi), utilized

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1/ The area off Alaska is considered the waters of the North Pacific Ocean and Bering Sea, generally north of 50° N. latitude and east of International Date Line.

MARINE FISHERIES REVIEW
Reprint No. 959

Table 1 - Japanese Fishing Vessels Off Alaska, 1952-70

Year	Stern Trawlers	Trawlers[1/]	Longline	Gillnet	Crab Catchers	Whale Killers	Total
1952				57		4	61
1953				105		4	109
1953	9			205		10	224
1955	6			247		14	367
1956	13			447		15	475
1957	13			405		17	435
1958	20			460		15	495
1959	44			460		15	519
1960	125-135			410		15	600-615
1961	125-135			410		15	600-615
1962	149	2	37	369	19	21	597
1963	85	3	115	369	9	21	599
1964	155	9	14	379	12	21	590
1965	116	8	12	369	10	25	540
1966	117	26	18	370	10	28	569
1967	128	71	23	370	10	33	627
1968	130	133	22	375	29	29	719
1969	98	118	37	399	46	26	724
1970	107	99	32	399	43	10	690

[1/] Includes side trawlers, pair trawlers, pair trawlers and Danish seiners.

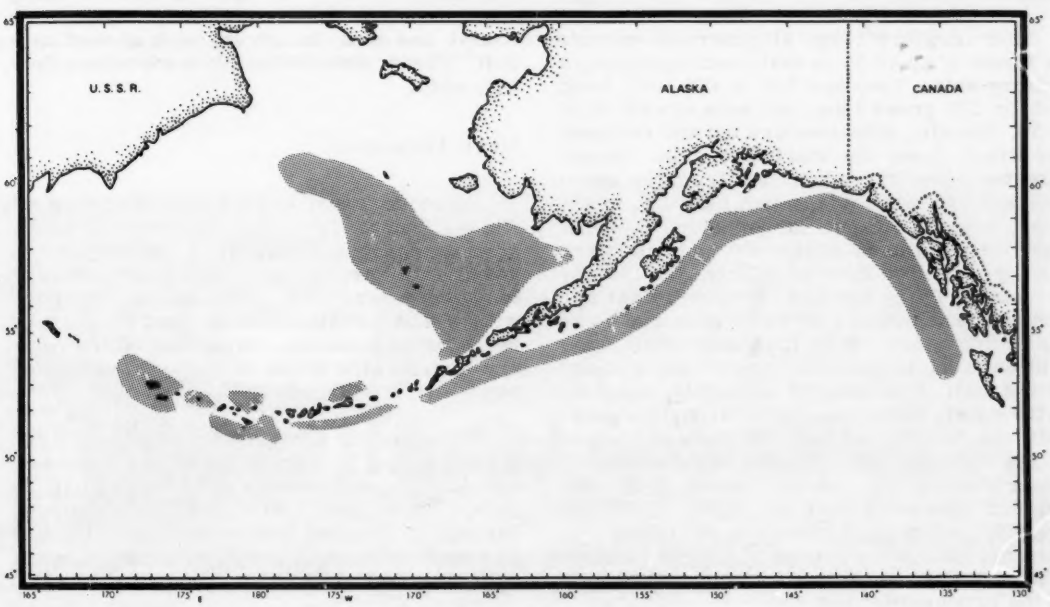

Fig. 1 - Japanese trawling areas off Alaska.

as a base stock for fish sausage, fish cakes, etc.

Trawling for shrimp northwest of the Pribilof Islands in the Bering Sea began in 1961. Peak annual landings of 34,775 metric tons occurred in 1963. Then these declined steadily until 1966, when they dropped to 3,230 metric tons--and the fishery ended.

The herring fishery started in 1966-67 with a catch of 3,000 metric tons. It expanded to about 35,000 metric tons in 1971. The fishery is conducted by trawlers from December through March between the Pribilof Islands and St. Matthew Island in the Bering Sea.

Japanese trawling off Alaska is conducted by four major types of ships: side trawlers, pair trawlers, Danish seiners, and stern trawlers. All use an active trawl net held open by trawl doors (side and stern trawlers), or by two boats pulling one net (pair trawlers). The exceptions are the Danish seiners. These use the traditional surrounding sweeping gear developed in the North Sea and called 'Scottish seining', 'Danish seining', or 'fly seining'.

Side Trawlers

Side trawlers (Fig. 2) generally operate in fleets of up to 30 vessels accompanying a factory ship. They are 100 to 170 feet long, 150 to 370 gross tons, and have crews of 20 to 30. Usually, side trawlers set and retrieve the trawl from the starboard side. Some, however, are rigged to set from the stern and retrieve to the side, much like U.S. west-coast vessels. Some larger side trawlers have refrigeration equipment and can operate for a limited time away from the factory or mothership. Usually, however, fleet operations are within a 20 to 30 mile radius of the factory ship. Side trawlers, after completion of haul, normally "unzip" the cod end of the net; it is secured alongside, dangling in the water, rather than being brought aboard with the fish. The filled cod ends are towed to the factory ship. There they are hoisted aboard, using the factory ship's gear, and dumped into large receiving bins. Cod ends are carried aboard trawlers so fishing can continue until several bags of fish are alongside and it is convenient to deliver the catch to the processing ship.

Pair Trawlers

Pair or two-boat trawlers operate one trawl net between two ships. Older pair trawlers (Fig. 3) are 90 to 150 feet long, 100 to 150 gross tons, and carry crews of 15 to 20. Recently designed pair trawlers (Fig. 4) are 122 feet long, 185 gross tons, and carry 14 to 16 persons.

Pair trawlers operate with one ship setting the gear and the second ship securing its warp to one wing of the net. Then they operate parallel to each other with the trawl net between them. When the trawl is completed, the net is hauled until one wing can be passed to the other partner, which completes the haul by itself. Like the side trawler, pair trawlers usually "unzip" the cod end of the net for delivery to a factory ship.

Danish seiners (Fig. 5) are 90 to 150 feet long, 100 to 150 gross tons, and have crews of 18 to 20. Recently a new type of Danish seiner (Fig. 6) has been operating off Alaska. These ships are about 90 feet long and 100 gross tons. Although similar in appearance to small stern trawlers, they employ their gear like older style vessels. Danish seiners set the net over the stern and usually retrieve it on the port side. The catch is brailed using a large dip net. Some newer ships have stern ramps and pull the whole catch aboard as a unit. These vessels usually work with a factory ship.

Stern Trawlers

Japanese stern trawlers operating off Alaska can be grouped into four (4) categories--ranging from small 300-gross-ton vessels to very large 5,000-gross-ton factory stern trawlers. They are all designed with a slip or stern ramp used to set and retrieve the trawl net. Depending on the fishery and/or size of the ship, they work independently or with a factory ship.

The smaller 300-gross-ton-class stern trawlers (Fig. 7) average 140 to 165 feet long, 250 to 350 gross tons, and carry 20 to 30 men. These small stern trawlers, although capable of limited independent operations if equipped with refrigeration, usually work with a factory ship.

Fig. 2 - Side trawler fishing in the eastern Bering Sea--one of several such vessels accompanying a factory ship which will process their catch.

Fig. 3 - Pair trawlers fishing in the eastern Bering Sea. The two vessels operate together towing one trawl. Pair trawlers, like side trawlers and Danish seiners, operate in fleets with a factory ship.

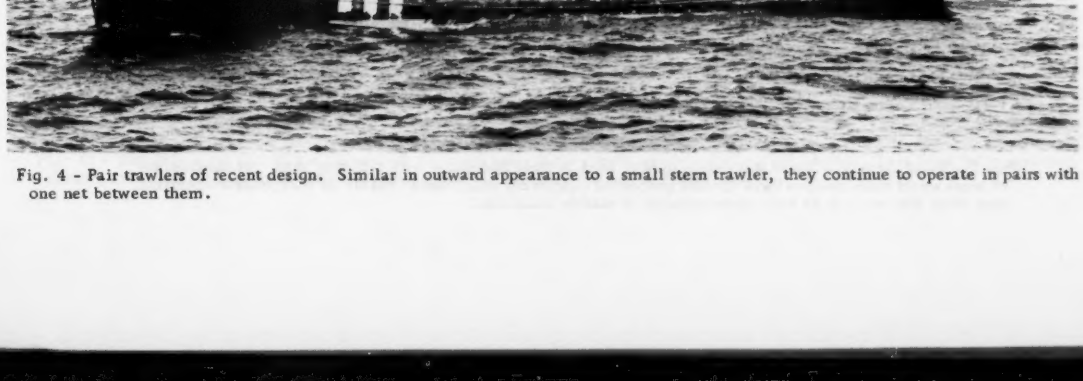

Fig. 4 - Pair trawlers of recent design. Similar in outward appearance to a small stern trawler, they continue to operate in pairs with one net between them.

Fig. 5 - Brailing fish from the net on a Danish seiner in the eastern Bering Sea. Danish seiners, like most side trawlers, fish in fleets with a factory ship which processes their catches.

Fig. 6 - New model of a Danish seiner. Newly constructed Danish seiners look like stern trawlers but fish with the same gear as the older Danish seiners.

Fig. 7 - Small stern trawlers of this design usually work in fleet operations with a factory ship. Although some of these small stern trawlers have limited processing equipment which would enable an independent operation, they must then work in an area where resupply is readily available.

Fig. 8 - A stern trawler of this size (500 gross tons) is designed for independent operations. Processing usually includes only heading and freezing. This type of stern trawler is used in many areas off Alaska.

Fig. 9 - Medium stern trawlers (1,500 gross tons) are usually equipped with modern processing machinery, sharp freezers, and sufficient refrigerated holds to allow them to operate for some time without support.

Fig. 10 - This ship is typical of the large (to 5,000 gross tons) factory stern trawlers working off Alaska. They have fully equipped factory areas and storage holds enabling them to operate extended periods in distant waters.

The 500-gross-ton-class stern trawler (Fig. 8) averages 170 to 190 feet long, 450 to 600 gross tons, and carries a crew of 20 to 35. These ships can operate independently if resupplied regularly. They are usually equipped with limited processing equipment, sharp freeze units, and refrigerated holds.

The 1,500-gross-ton stern-class trawler (Fig. 9) averages 230 to 270 feet long, 1,400 to 1,800 gross tons, and carries 70 to 90 men. These ships can operate for greater periods without resupply. Generally, they have a large processing area with modern machinery for washing, heading and gutting, and filleting the catch; also, they have a reduction plant to reduce fish to fish meal. Plate freezers and refrigerated holds are standard equipment.

Large factory stern trawlers (Fig. 10) are 290 to 370 feet long, 2,500 gross tons, and carry 90 to 135. They can operate for extended periods without resupply or returning to port. The factory areas are equipped with modern machinery to head, gut, fillet, and skin the catch; the larger ships have machinery to produce minced fish meat, called "surimi" or "otoshimi". Most have reduction plants to utilize waste and scrap fish for meal and oil.

LONGLINE FISHING

In 1960, the Japanese began longlining off Alaska in the Bering Sea; in 1963, they expanded to the Gulf of Alaska (Fig. 11). Since 1963, the Gulf of Alaska fishery has increased continually, while effort in the Bering Sea has declined. The annual longline catches reached 62 million pounds in 1970.

The longline fishery is primarily for sablefish (Anoplopoma fimbria), with an incidental catch of rockfish (Sebastodes sp.) Individual ships fish 12 to 13 miles of longline with about 8,000 hooks. Gear is set from the stern in 100 to 400 fathoms, held by anchors, and marked by flag and radio buoys. Fishing time is usually 12 hours; after that, the gear is retrieved using a line hauler on the ship's starboard side.

The first longliners (Fig. 12) off Alaska were similar to ships used in tuna longline fishery in southern waters. They had open well decks that exposed crew to the adverse weather common off Alaska. A more recent design (Fig. 13) has covered work areas that protect the crew. These ships are 120 to 170 feet long, 200 to 500 gross tons, and have crews of 25 to 30. Equipped with sharp

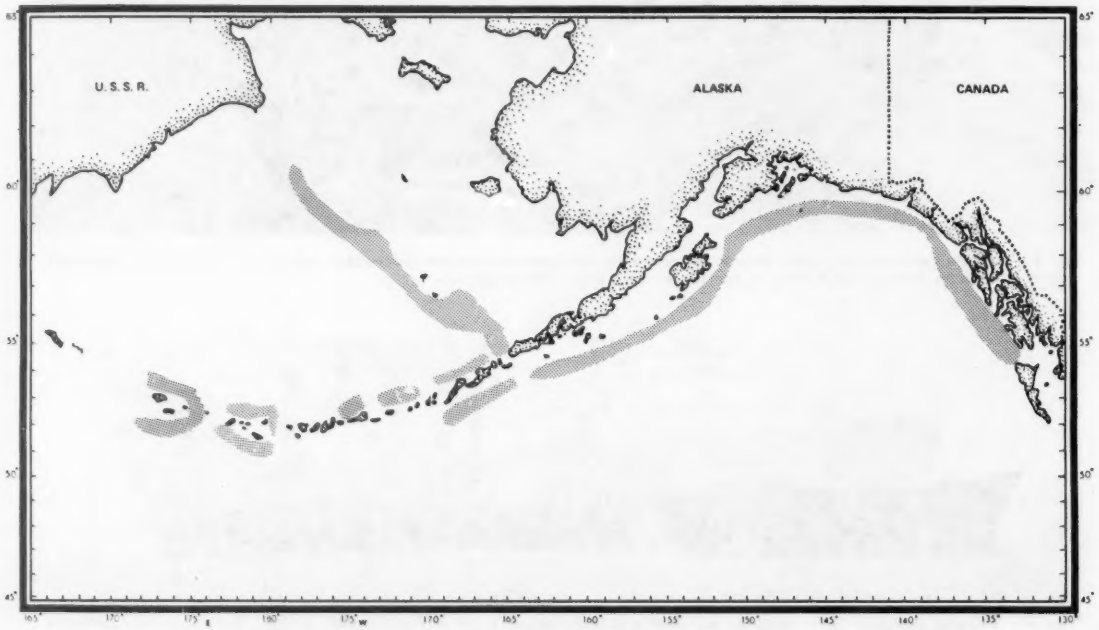

Fig. 11 - Japanese longline fishing areas off Alaska.

Fig. 12 - Japanese longliner fishing in the Gulf of Alaska. This ship is typical of the older style longliner with the open work area on deck.

Fig. 13 - This ship is typical of the new design Japanese longliner with covered well decks enabling the crew to work during inclement weather. Note the opening in the well deck on the starboard side where the fishermen are retrieving the longline.

freezers and refrigerated holds, they can operate independently. They make 2 or 3 trips to Alaskan area a year. They stay $1\frac{1}{2}$ to 3 months per trip.

GILLNET FISHING OPERATION

Japanese gillnetting off Alaska (Fig. 14) is primarily for salmon (genus Oncorhynchus), but there is also a small fishery for herring (Clupea pallasii). In 1963, a small exploratory gillnet fishery was conducted in the Gulf of Alaska primarily for sablefish (Anoplopoma fimbria). This fishery was abandoned in 1964.

The gillnet fishing vessels (Fig. 15) are 80 to 90 feet long, 70 to 100 gross tons, and have crews of 19 to 20. These ships operate in a fleet and deliver their catch daily to a factory ship for processing. The gillnet used for salmon is about 9 miles long by 18 to 20 feet deep, and about $4\frac{1}{2}$-inch mesh stretch measure monofilament nylon. It is fished on the surface. A herring gillnet is shorter, about 2-inch (stretch measure) mesh stranded nylon web; generally, it is anchored and submerged.

A gillnetter stores its net in a bin on the vessel's stern. The net is set from the stern and marked with radio buoys and flags. It is set just before dark and retrieved at first light the next morning. The net is retrieved by a vertical shiv hauler, built to engage the lead line, and mounted forward on the port side. As the net comes aboard, the fish are removed and the net is transferred to the stern for storage until reset.

CRAB FISHING OPERATION

The Japanese fish for king crab (Paralithodes sp.) and tanner crab (Chioneocetes sp.) on the Continental Shelf in the eastern Bering Sea (Fig. 16). Tangle nets have been used since the beginning of the fishery. Only in recent years have they begun using crab pots. In 1970, they fished extensively with pots in addition to tangle nets; in 1971, they did not use tangle nets until the very end of the season.

Tangle nets are large meshed nets (18-inch stretched measure) set in extensive fields up to 10 square miles. The nets are anchored along ocean floor, entangling crab as they travel along bottom.

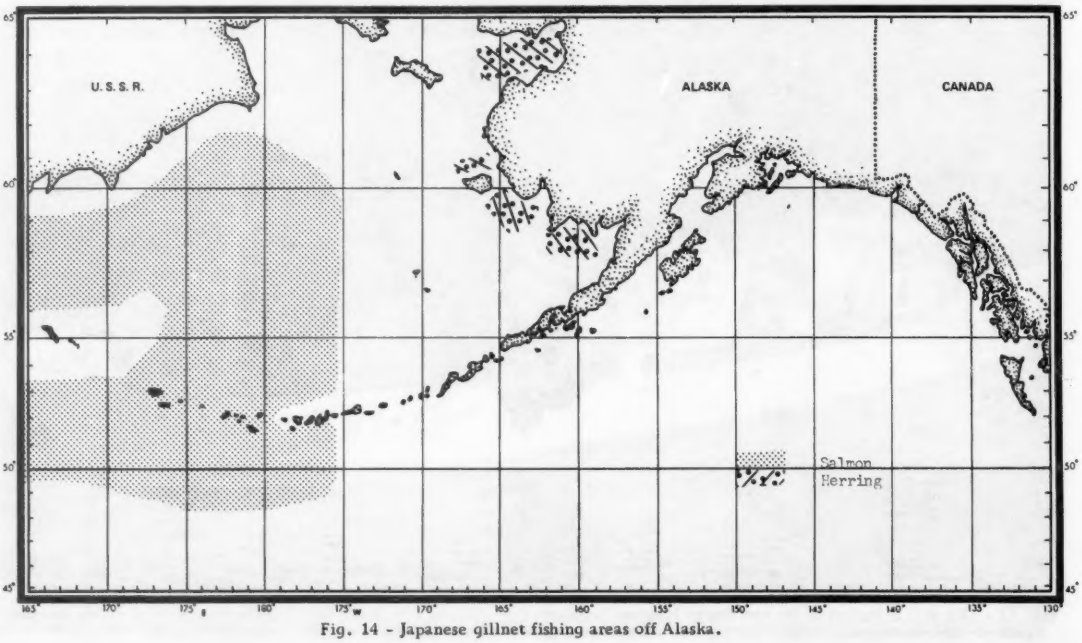

Fig. 14 - Japanese gillnet fishing areas off Alaska.

Fig. 15 - Salmon gillnet fishing vessel hauling a gillnet in the central Bering Sea. This ship is typical of those working in fleets with a factory ship off Alaska.

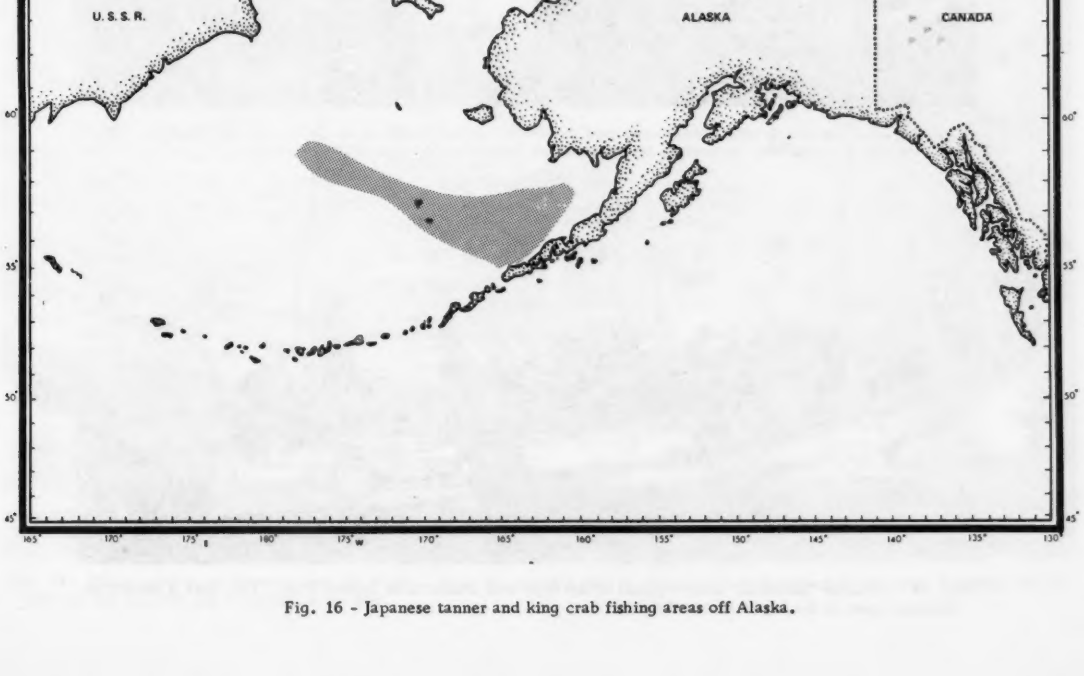

Fig. 16 - Japanese tanner and king crab fishing areas off Alaska.

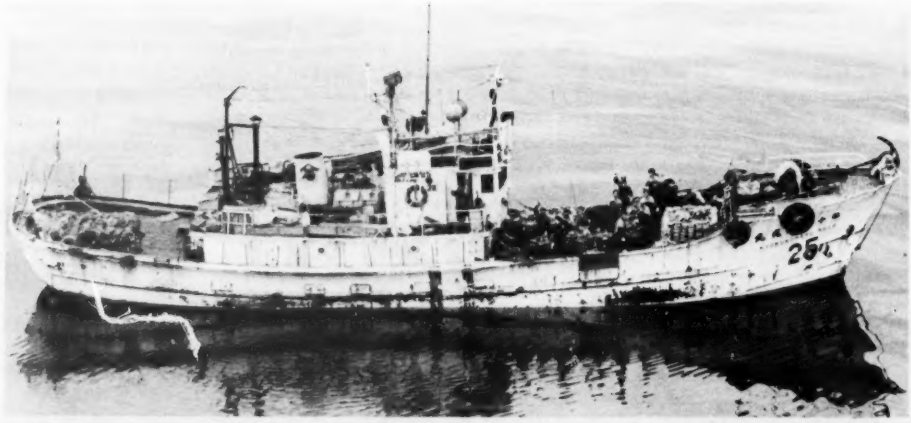

Fig. 17 - Tanglenet fishing vessel operating in the Japanese crab fishery of the eastern Bering Sea. As the tanglenet is brought aboard, the crab are removed and placed in large cargo nets for transfer to the factory ship.

Fig. 18 - Crab pot fishing vessel (dokkosen) used in fleet operations by the Japanese in their crab fishery. Conical shaped crab pots used extensively by the Japanese for tanner crab are visible on board.

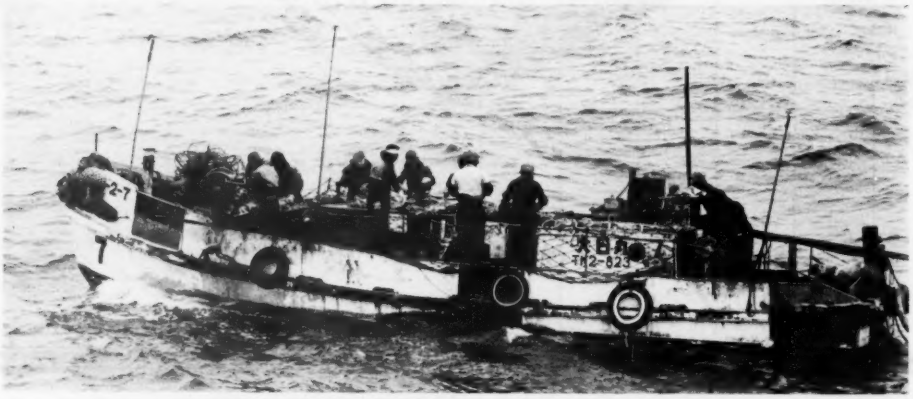

Fig. 19 - Japanese "kawasaki" boat--typical of the type used aboard most factory ships. This boat is retrieving tanglenet gear in the Japanese crab fishery.

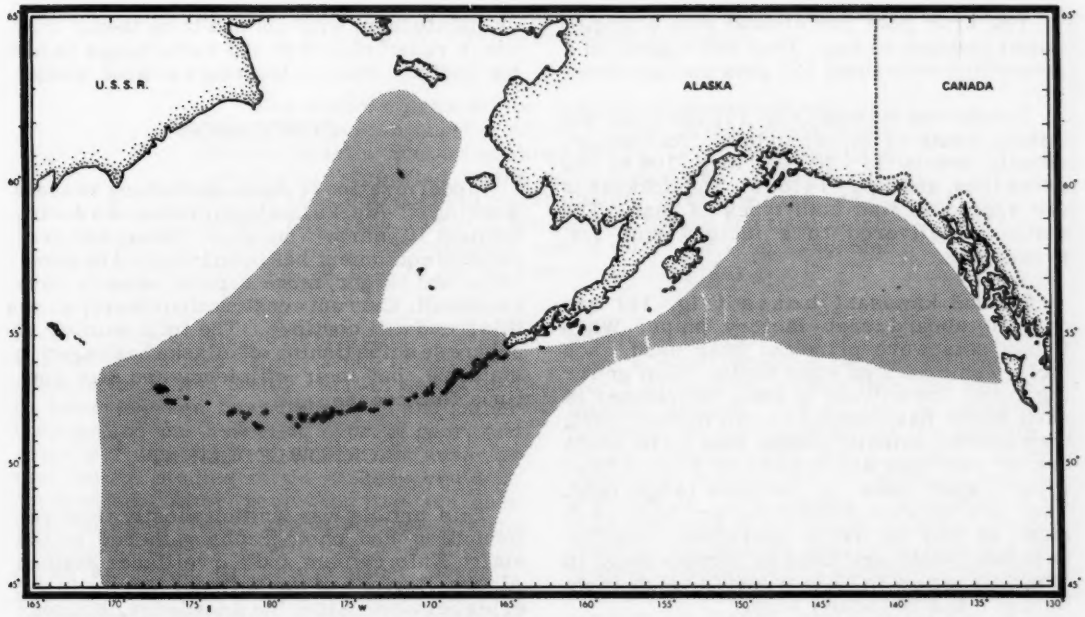

Fig. 20 - Japanese whaling area off Alaska.

Fig. 21 - Whale catcher of the type used off Alaska. Note the catwalk used by the captain or harpooner to get from the bridge to the bow and the harpoon gun mounted on the bow.

The crab pots are conical with a single-tunnel opening on top. They are rigged on a groundline with about 125 pots on each line.

Tangle-net setters (Fig. 17) and crab-pot fishing boats (Fig. 18) called 'dokkosens', usually are 90 to 120 feet long, 100 to 150 gross tons, and carry 14 to 15. The dokkosens are rigged to fish both types of gear. The catch is delivered to a factory ship for processing.

Several kawasaki boats (Fig. 19) are carried aboard crab factory ships. When tangle nets were principal gear used, each factory ship carried eight boats. With growing trend toward use of pots, the number of such boats has dropped to two in each fleet; they seldom actually handle gear. The boats are 40 feet long and crewed by 9 to 10 fishermen when used to retrieve tangle nets. They are hoisted aboard factory ship each night at end of day's operation. Similar kawasaki boats are used by factory ships in other fisheries to help transfer catch from fishing boats to factory ship.

WHALING OPERATION

Japanese whaling off Alaska (Fig. 20) is conducted by whale catchers (Fig. 21) in fleets of 6 to 10 with a factory ship. A typical catcher vessel is 195 to 210 feet long, 500 to 750 gross tons, speeds up to 20 knots, and crew of 18 to 20. The catchers range as far as 200 miles from their factory ships when scouting for whales. The whales are killed by explosive-headed harpoons fired from a gun mounted on the high bow. The harpooner is often the captain. After positioning the ship near the whale, he runs on a catwalk from bridge to bow to man the gun. The catchers either deliver the whales to the factory ship, or inflate them with air and buoy them; they use a radar reflector and radio buoys to aid the factory ship in locating the dead whale.

CONCLUSION

Modernization of Japanese fishing vessels working off Alaska has been continuous during the past 10 years. The latest fishing and processing equipment has been installed on some ships and larger, more capable vessels have been built. Current construction clearly shows this trend will continue. The total number of Japanese ships fishing off Alaska has begun to stabilize, but their efficiency and size continue to increase.

ACKNOWLEDGMENT

This article was written mostly from information and photographs gathered by the entire Enforcement and Surveillance staff in Alaska, Region 5 of the National Marine Fisheries Service. Also, the knowledge, suggestions, and encouragement by Jim H. Branson, Supervisory Fisheries Management Agent, were particularly helpful.

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A SURVEY OF THE SEA BASS FISHERY

David W. Frame and Scott A. Pearce

The authors present the results of interviews with sea bass fishermen along the Atlantic coast of the United States (Massachusetts-South Carolina) during 1971. Two sea bass species are reported in the catch statistics: Centropristis striata and Centropristis philadelphica. Both are captured by trawls and traps. Trawls account for 64% of the total catch; traps for 35%. The catch per unit of effort for trap fishermen ranges from 0.72 to 176.47 pounds per trap-day.

Very little scientific information is available on the sea bass fishery along the Atlantic coast of the United States. In 1971 we decided to interview sea bass fishermen and gather information on the catch, type of gear, and catch per unit of effort in different areas so that future studies of the fishery could be formulated. After reviewing the sea bass literature, we found a few studies dealing with catch and gear type--but no studies on effort and catch per unit of effort. Investigations have been primarily concerned with geographic distribution (Baird, 1873; Smith, 1907; Bullis and Thompson, 1965; Struhsaker, 1969), embryology (Wilson, 1889), or movement and spawning (Sherwood and Edwards, 1901). Only Lavenda (1949) has aged the black sea bass and measured the differences that occur between the sexes.

The black sea bass (Centropristis striata) ranges from Massachusetts to Florida; the rock sea bass (Centropristis philadelphica) from North Carolina into the Gulf of Mexico. Although both species are exploited throughout their range, our survey extended only from Massachusetts to South Carolina. For survey purposes, we divided the area into three regions: North Atlantic (Massachusetts, Rhode Island, Connecticut, New York), Middle Atlantic (New Jersey, Maryland, Delaware, Virginia), and South Atlantic (North and South Carolina).

GEAR AND SEASONS

Trawls for capturing sea bass range in size from a No. 35 to a No. 41 Yankee (Knake, 1956). Bosom and wing foot ropes have wooden or rubber rollers and the cod-end is protected by chafing gear. Trawls are fished over a wide range of depths, 50 feet in the North Atlantic to greater than 300 feet in the Middle Atlantic. Trawling is restricted, however, to firm bottoms in the vicinity of rocks, wrecks, and reefs. South Atlantic fishermen refer to the low profile coral formations as "live bottom." The bulk of the trawl catches in the North Atlantic are confined to two periods, March to June and September to November. Landings in the Middle and South Atlantic are greatest during September to March, although fishing is conducted throughout the year.

Wooden and wire traps are designed to catch sea bass. Within each category there is a traditional and a modern trap (Table 1). Traditional wooden traps are used in the Middle and North Atlantic (Fig. 1). In New York, the traditional sea bass traps have been modified to catch American lobster (Homarus americanus); sea bass landings by these traps are incidental to the lobster catch. Each fisherman in the Middle Atlantic lifts a part of his several hundred wooden sea bass traps each fishing day. No baits are used because, according to fishermen, they attract crabs. As a result of declining fish catches in recent years, some fishermen in the Middle Atlantic States have shifted to a modern trap, which is designed to capture light poundages of both lobster and sea bass (Fig. 2). Depths fished in the Middle Atlantic range from 65 feet to 110 feet over rocks and reefs (Table 2). All traps are first set in May and are removed from the water for storage in November. The largest catches are made in May and October. In the South

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Table 1 - Measurements taken from the sea bass traps (in inches)

Fishing Regions	Trap Description	Height	Width	Depth	First net Height	First net Width	First net Depth	Second net Height	Second net Width	Second net Depth
	Wood									
Middle Atlantic (New Jersey, Maryland, Virginia)	Traditional	14	18	47	5	5	12	10	1½	9
	Modern	20	29	48	7	8	16	5	9	12

					Funnels Height	Funnels Width	Funnels Depth	Bait well Height	Bait well Diameter
	Wire								
South Atlantic (North Carolina, South Carolina)	Traditional	24	24	24	6	9	5	10	4
	Modern	36	36	36	14	10	9	24	9

Table 2 - Summary of information taken from interviews with trap fishermen, 1971: fishing seasons and depths

Port	Max. # of trap fishermen	Trap type	Season	Best months in season	Poor months in season	Fishing depths
Cape May and Wildwood, N. J.	10	wood	May-November	May, October	July, August	May-June 65'-95' Jul.-Nov. (95'-135')
Ocean City, Maryland	3	wood	May-October	May, June, October	July, August	May-June 65'-75' Jul.-Nov. (75'-85'-95'-125')
Chincoteague, Virginia	2	wood	May-September	May, June	July, August	all months 100'-110'
Sneads Ferry, North Carolina	4 (40 in season)	wire	all year	September-February	May, July	random 45'-120'
Southport, North Carolina	2 (13 in season)	wire	all year	September-March	July, August	Oct. 65' Dec. 80' Feb. 95' Apr. 100' June 120'
Wilmington North Carolina	1	wire	all year	September-December	May-August	-
Little River, SouthCarolina	3	wire	September-June	-	-	random 75'-120'
McClellansville, South Carolina	5	wire	November-June	-	-	random 75'-130'

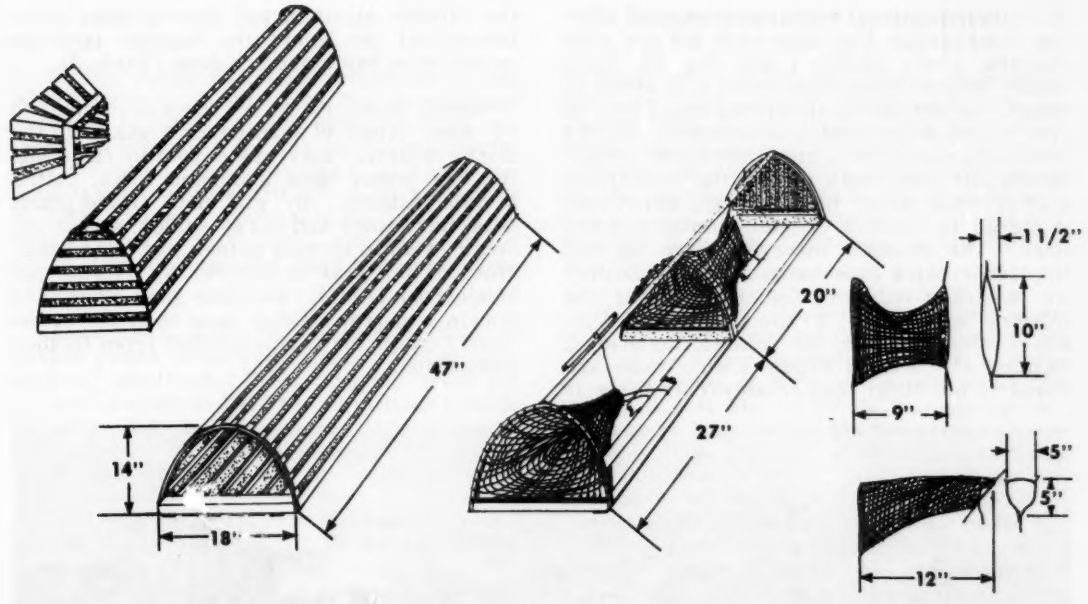

Fig. 1 - Traditional sea bass trap used by fishermen in New Jersey, Maryland, and Virginia. In the upper left is a sea bass trap modified for lobster fishing.

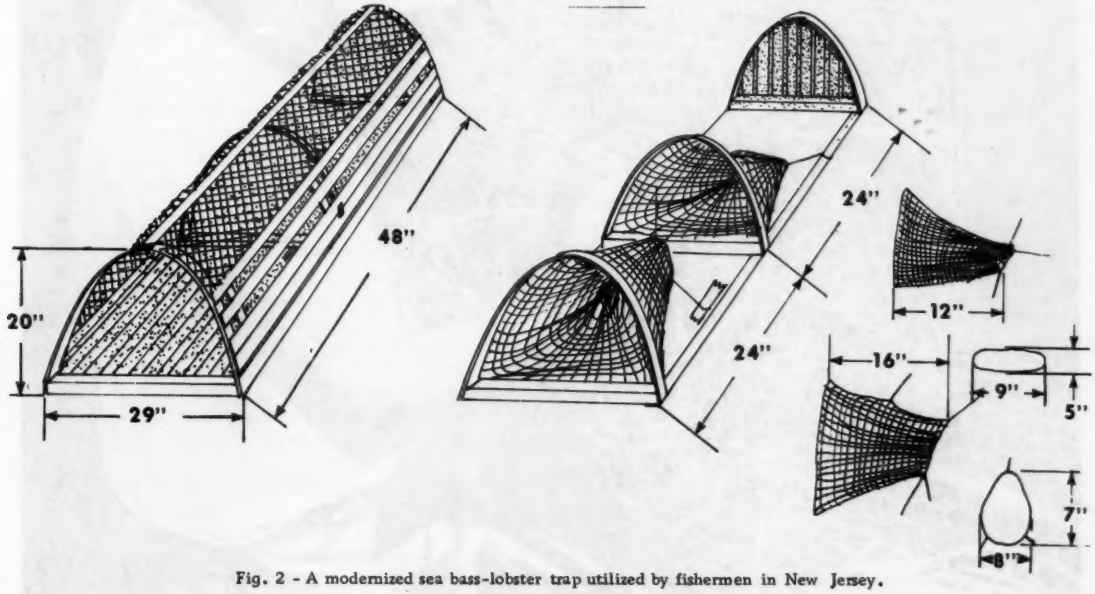

Fig. 2 - A modernized sea bass-lobster trap utilized by fishermen in New Jersey.

Atlantic, traditional wire traps designed after the Chesapeake Bay blue crab pot are used (Rivers, 1966) (Table 1 and Fig. 3). Each South Atlantic fisherman owns only about 30 traps. He set and hauls all the traps four to five times a day and, occasionally, allows them to remain in the water overnight. Practically all fishermen prefer the traditional trap over the larger modern trap, which was designed to capture greater numbers of sea bass. The catches, however, have not met the fishermen's expectations. In our survey we observed only two fishermen using the modern wire trap. Traps are baited with squid, striped mullet, or Atlantic menhaden. Depths and bottom types where bass are found do not differ appreciably from those in the Middle Atlantic, but fishing takes place throughout the year; the highest landings occur from September to June (Table 2).

Small numbers of sea bass are captured by other types of commercial gear. In the North Atlantic, they are caught by fixed and floating pound nets and hand lines; in the Middle Atlantic, by gill nets, fixed pound nets, hand lines and purse seines; and in the South Atlantic by haul seines and hand lines. Most of this gear is pictured by Dumont and Sundstrom (1961). Because gear other than trawls and traps catch less than 2% of the yearly catch, they are excluded from further discussion.

Fig. 3 - John Muellerweiss of Southport, North Carolina, positions a traditional wire trap on his vessel's stern, prior to baiting and discharging the trap.

CATCH

In the catch statistics compiled by the NMFS Branch of Statistics, the two species are not separated. We assumed that all landings recorded for the North and Middle Atlantic were black sea bass, and that the landings in the South Atlantic were a mixture of both species. We compiled landings by region from 1960 to 1968, the last year for which regional catches have been published (Table 3).

Since 1965, when the largest landings in recent years were recorded, catches have steadily declined. They dropped from 8.8 million pounds in 1965 to 2.8 million pounds in 1971. This decline has resulted, primarily, from a drop in trawl catches in the Middle Atlantic.

Of the commercial gear, trawls accounted for the largest percentage of the catch, followed by traps (wooden and wire). The trap catch exceeded the trawl catch in only one year, 1967. Since 1960, trawls have averaged 64% of the total catch: 5% landed in the North Atlantic, 50% in the Middle Atlantic, and 9% in the South Atlantic. Most catches by trawlers--locally called draggers--in the Middle Atlantic are landed at Hampton, Virginia. Sea bass account for only a fraction of a dragger's catch. In the South Atlantic, shrimp fishermen change to a different type of trawl in the winter (November to March) to catch fish. During the recent decline in total landings, trawl catches of sea bass in the South Atlantic have been increasing.

The trap fishery accounts for an average of 35% of the total landings. When this figure is added to the trawl landings, 99% of the sea bass catch can be accounted for. Like the trawl landings, however, lowest poundage is landed in the North Atlantic (2%), followed by the South Atlantic (10%), and the Middle Atlantic (23%). In the South Atlantic, captains who operate sport-fishing vessels during the summer begin trap fishing in the fall. These boats account for the major part of the North Carolina catch.

Figures for the catch landed by anglers are not available. The catch appears to be large. Deuel and Clark estimated the 1965 landings in the North and Middle Atlantic at 9.1 million pounds, 300,000 pounds greater than the total commercial catch.

CATCH PER UNIT OF EFFORT

Since we could not calculate a meaningful catch per unit of effort for all gear with the limited data at our disposal, we did not attempt to compare efficiencies of all gear. However, we did find that unadjusted figures for the trap fishery showed that trap fishermen in the South Atlantic had far greater success than trap fishermen in the Middle Atlantic.

In the Middle Atlantic, a trap fisherman sets 400 to 1,500 traps in May and removes them at the end of the fishing season in October. Each day of the week he lifts about 200 traps. (Table 4). As the daily poundage decreases in late spring, the fisherman allows the gear to remain in the water longer. The daily poundage, however, continues to decline even with the increased gear fishing time. These opposing factors act to decrease the CPUE. The problem of gear fishing time does not occur in the South Atlantic because a fisherman either fishes his 30 traps 4 to 5 times a day or he does not fish.

Examination of the Middle Atlantic fishing success shows that the maximum CPUE increased with each port to the south (Table 4). Since the mean fishing time decreased only slightly, the higher CPUE resulted from increased catches. The best landings occurred at the southernmost port, Chincoteague, Virginia.

In the South Atlantic, where two sea bass species are caught, the maximum CPUE was higher than any port in the Middle Atlantic. The best catches occurred at Sneads Ferry, North Carolina, where the average landings exceeded 3,000 pounds in the fall and winter. Maximum CPUE values for North and South Carolina ports fell in the range 8.11 to 178.57.

Conclusions

Trawls and trap account for 99% of the commercial sea bass catch. Most of the catch (73%--average for the years 1960-1968) is landed in the Middle Atlantic, followed by the South Atlantic (19%). On the basis of the CPUE, the trap fishermen in the South Atlantic are more successful than the trap fishermen in the Middle Atlantic. We believe their greater success results from a greater abundance of sea bass. Whether

Table 3.--Landings of sea bass by gear recorded by the Branch of Statistics, National Marine Fisheries Service.

	NORTH ATLANTIC					MIDDLE ATLANTIC				SOUTH ATLANTIC				
Year	Otter Trawls	Fixed Pound Nets	Floating Pound Nets	Hand Lines	Wooden Traps	Otter Trawls	Fixed Pound Nets	Hand Lines	Wooden Traps	Otter Trawls	Hand Lines	Wire Traps	Misc. Gear All[1] Areas	TOTAL[2]
1960	629,000	3,000	140,200	1,920	55,900	4,733,200	13,600	14,400	1,235,600	37,000	85,500	33,000	100	6,982,420
1961	378,900	4,200	112,900	3,000	76,500	3,750,200	700	5,200	1,089,500	326,400	112,600	519,800	300	6,380,200
1962	524,700	2,200	95,200	1,100	115,000	4,833,600	1,700	10,000	2,241,400	971,200	61,900	521,600	400	9,380,000
1963	469,700	900	76,000	400	188,800	5,069,400	800	6,700	2,351,300	525,900	89,500	387,700	3,000	9,170,100
1964	367,500	1,600	127,400	500	184,400	4,062,300	700	13,000	2,161,200	613,700	61,500	464,800	--	8,058,600
1965	272,300	1,900	83,800	300	155,400	4,792,100	300	10,400	2,348,500	629,000	66,900	476,700	100	8,837,700
1966	182,000	4,300	63,300	200	51,400	1,876,800	2,500	1,400	1,170,500	639,400	38,500	591,100	4,100	4,625,500
1967	54,700	5,200	39,400	400	64,900	1,352,400	--	3,600	1,020,600	641,000	8,500	1,410,200	--	4,600,900
1968	73,900	2,500	33,900	500	6,900	1,553,800	400	1,800	703,700	626,400	38,700	731,600	--	3,774,100

[1]Haul seines, purse seines, gill nets.

[2]The last complete digest was in 1968. For the years 1969-1971 the Interim Reports estimated total catch 1969: 4,400,000; 1970: 4,482,000; 1971: 2,821,000.

Table 4.--Summary of information taken from interviews with trap fishermen, 1971, calculation of mean catch per unit of effort (CPUE).

Ports	Mean no. traps per boat	Mean no. times each trap lifted per day	Mean no. traps fished per day per vessel	Mean no. trap days per lift	Mean no. trap days	Range in mean no. pounds caught per day per vessel		CPUE Range (Mean no. pounds per trap day)	
						Low	High	Low	High
Cape May and Wildwood, New Jersey	950	0.21	200	4.75	950	144	875	0.15	0.92
Ocean City, Maryland	1,165	0.21	250	4.66	1,165	366	1,966	0.31	1.69
Chincoteague, Virginia	1,125	0.22	250	4.50	1,125	625	3,500	0.56	3.11
Sneads Ferry, North Carolina	21	4.00	21	0.25	21	200	3,750	9.52	178.57
Southport, North Carolina	25	4.00	25	0.25	25	225	2,000	9.00	80.00
Wilmington, North Carolina	37	2.00	37	0.50	37	200	1,700	5.41	45.95
Little River, South Carolina	37	4.00	37	0.25	37	300	1,500	8.11	40.54
McClellansville, South Carolina	31	4.00	31	0.25	31	500	2,000	16.13	64.52

the greater abundance is due to the presence of two species, we do not know, since we made no attempt to assess the relative proportions of each species in the catch

Acknowledgments

We thank Dr. Lionel Walford for alerting us to the lack of information on sea bass. Mr. William Nicholson and Mr. Robert Lewis reviewed the manuscript and made several helpful suggestions. We thank them for their patience.

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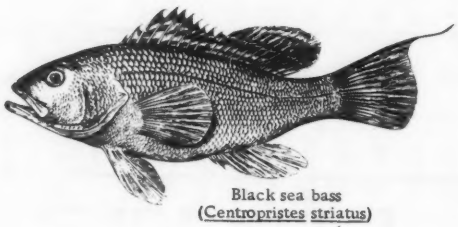

Black sea bass
(Centropristes striatus)

PORTABLE BARGE FOR ESTUARINE RESEARCH

Dennis A. Emiliani and Frank Marullo

Shrimp biology research conducted by the National Marine Fisheries Service Gulf Coastal Fisheries Center, Galveston Laboratory, required that personnel work for extended periods in estuaries along the Texas coast. Since conventional craft could not be used for transporting personnel and equipment (total weight in excess of 5,000 pounds) to these areas, a barge was designed and built for this purpose.

BARGE

The barge (Fig. 1) consists of three pontoons, a deck, and a frame to support a canvas cover. A parts list is presented in Table 1. Numbers in parentheses in this article correspond to those used for identification in Figure 1 and Table 1.

Pontoons

Each pontoon has two 8-ft sections made from aluminum plates (1 and 2) with welded seams. The rear section cutaway exposes two aluminum pipes (5) used for reinforcement and a watertight bulkhead (6) that are welded into each 8-ft section. The sections are bolted together (9) to form one 16-ft pontoon. An aluminum plate (3) with four $\frac{1}{2}$-inch studs is welded to the back of the center pontoon to accommodate an outboard transom bracket (4). Five aluminum angles (10) are welded to the top of each 8-ft section.

Deck

Twenty aluminum channels (8) are bolted to the angles on top of each pontoon to form a 16-ft by 16-ft frame to support the decking. After the channels are secured, eight brackets (14 and 15) that accommodate the legs of the pipe frame are bolted into place. Eight sheets of marine plywood (16) forming a platform are then laid over the channels and secured around the outside edges with sheet metal screws.

Pipe Frame and Canvas Cover

The frame (17-26a) is constructed of galvanized pipe and pipe fittings. Numerous unions are installed in the framework to reduce bulk and simplify handling of sections during assembly and disassembly. Pipe installed between each leg of the frame serves as a safety rail and provides tie-down points for the canvas cover (not shown). Mosquito netting (not shown) is tied to the top of the frame.

This barge, powered by an outboard motor (18 hp recommended), is a stable, self-propelled work platform that can be used to conduct research in remote estuarine areas.

The barge is transported (partially disassembled) on a modified boat trailer and can be assembled in the water by two men within 2 hours. It will support at least 5,000 pounds and can be maneuvered in 18 inches of water with the outboard motor. With the canvas roof and the mosquito netting in place, personnel can use the platform for an overnight camp site using conventional camping equipment.

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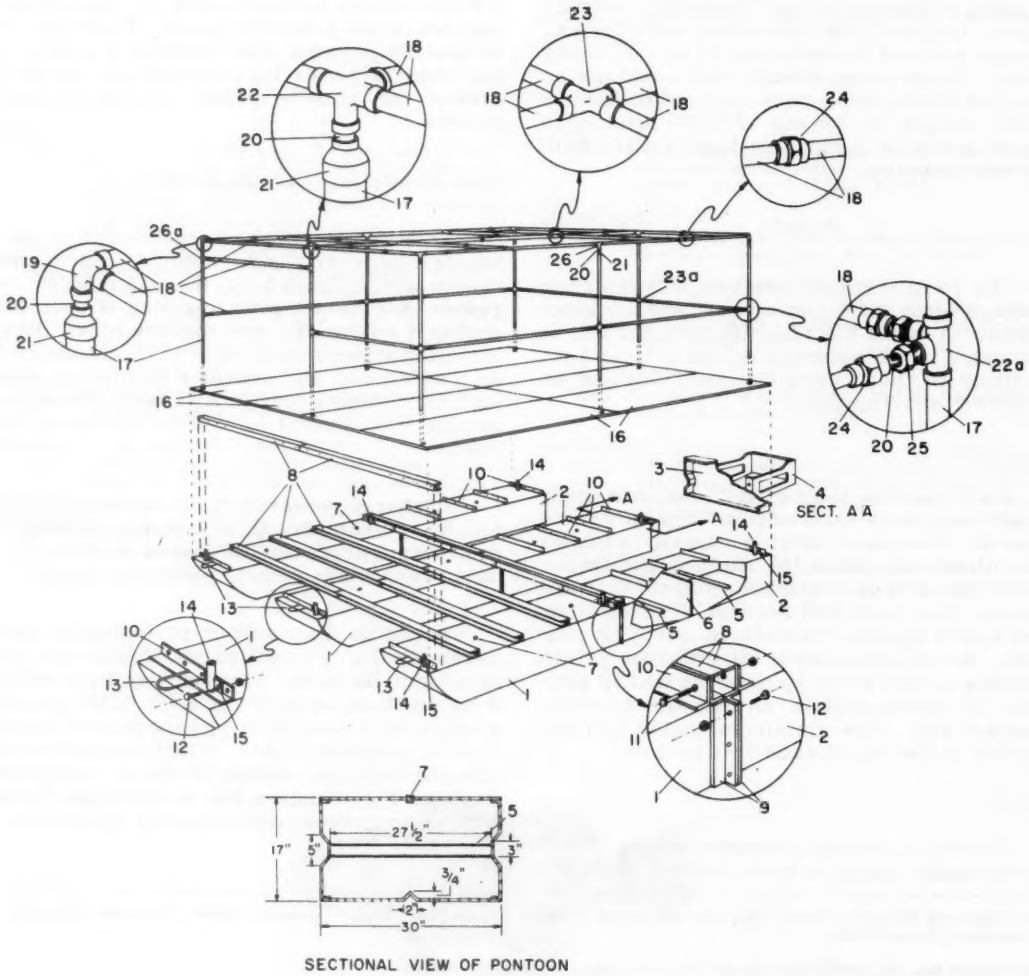
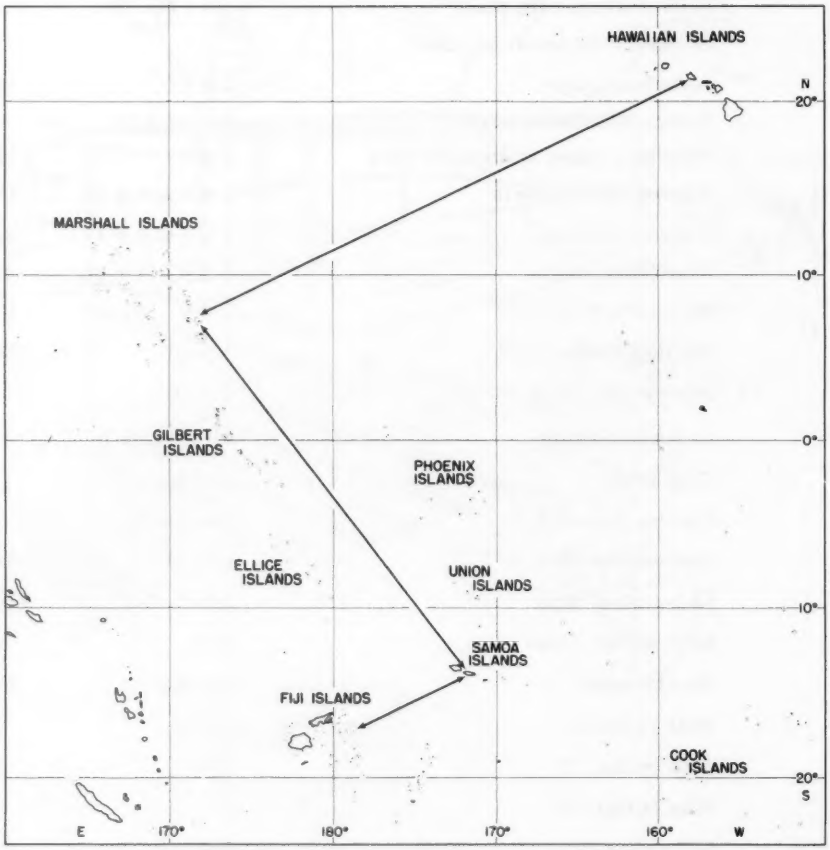


Fig. 1 - Assembly diagram for barge.

Table 1. --Materials list for barge

Identification number	Description	Size (inches)	Number required
1	Front pontoon - 1/8-inch aluminum plate	17 x 30 x 96	3
2	Rear pontoon - 1/8-inch aluminum plate	17 x 30 x 96	3
3	½-inch aluminum plate	½ x 17 x 30	1
4	Outboard transom bracket		1
5	Aluminum pipe	2 x 27	12
6	½-inch aluminum plate	½ x 17 x 30	6
7	Stainless steel inspection plug	½ x 1	12
8	Aluminum channels	¼ x 2 x 4 x 96	20
9	Aluminum angle	½ x 2 x 2 x 17	12
10	Aluminum angle	½ x 4 x 4 x 30	30
11	Stainless steel bolt	½ x 6	10
12	Stainless steel bolt	½ x 1½	80
13	Aluminum round stock	½ x 10	5
14	Galvanized pipe	1½ O. D. x 8	8
15	Flat stock	3/8 x 4 x 2	8
16	Marine plywood	½ x 4 x 96	8
17	Galvanized pipe	1 O. D.	62 feet
18	Galvanized pipe	3/4 O. D.	174 feet
19	Side outlet elbow	3/4	4
20	Short nipple	3/4 x 1	24
21	Bell reducer	1-3/4	8
22	Side outlet "T"	3/4	2
22a	Side outlet "T"	1	3
23	90° cross	3/4	2
23a	90° cross	1	3
24	Union	3/4	31
25	Bushing reducer	1-3/4	16
26	90° "T"	3/4	6
26a	90° "T"	1	4



Track of M/V 'Anela,' charter cruise, February 8-May 9, 1972.

TUNA: Pole-and-Line Fishing Trials In Central and Western Pacific

R.N. Uchida and R.F. Sumida

The growing interest of the U.S. tuna fishing industry in the development of resources outside the Inter-American Tropical Tuna Commission's regulatory area in the eastern Pacific created an urgent need to assess the tuna-harvesting potential of the central and western Pacific Ocean.

This article presents quantitative baiting and fishing data obtained aboard the Honolulu-based pole-and-line fishing vessel 'Anela'. The vessel explored the possibility of developing commercial fisheries for surface schooling tuna in the Marshalls and American Samoa under a charter of the National Marine Fisheries Service (NMFS).

Anela found the tuna resources in the Marshalls and American Samoa impressive. Bait was plentiful in the Marshalls but scarce in American and Western Samoa. To conduct fishing trials in American Samoan waters, Anela caught bait in Fiji. Both tuna and bait were abundant around Fiji.

The M/V Anela was built in 1971 for the Angel Fishing Company of Honolulu. It was designed for pole-and-line fishing with live bait. It prospected for tuna from February 8 to May 9, 1972, in the central and western tropical Pacific--more particularly in waters of the Marshall Islands and American Samoa.

Anela was chartered by NMFS Southwest Fisheries Center, Honolulu Laboratory, under a formal contract with the Angel Fishing Company. Its mission was to explore the possibility of developing commercial pole-and-line fisheries for skipjack tuna, Katsuwonus pelamis, in the Marshalls and American Samoa. These two areas have been under consideration as potential bases for skipjack fishery development by the PIDC (Pacific Islands Development Commission). The Commission consists of the chief executives of the Governments of Hawaii, American Samoa, Guam, and the Trust Territory of the Pacific Islands. It was formed for cooperative economic development.

The contract stipulated that 20 fishing and baiting days be expended in the Marshalls--10 days (or fewer if a full catch load was obtained in less time) on the outward leg of the cruise, and the balance on the homeward leg. The remaining fishing and baiting time was to be used near American Samoa. Time was allowed for traveling to and from the areas of operation, unloading the catch, loading provisions, and refueling. Allowance also was made for days the vessel could not fish because of bad weather.

The contract stated that observers from NMFS, the Marshall Islands District of the Trust Territory, and the Government of American Samoa were to be accommodated on the vessel.

ANELA'S SPECIFICATIONS

Anela is the most recent addition to the Hawaii skipjack fishing fleet (Fig. 1). Propelled by an 850-hp Caterpillar[1] D398 engine,

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[1]Use of trade names throughout this article does not imply endorsement by the National Marine Fisheries Service.

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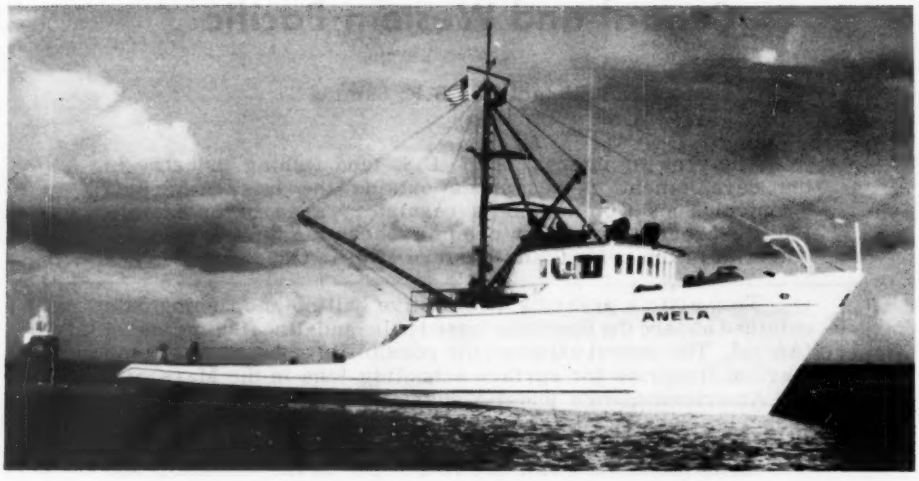

Fig. 1 - 'Anela' anchored in Majuro Lagoon, Marshall Islands.

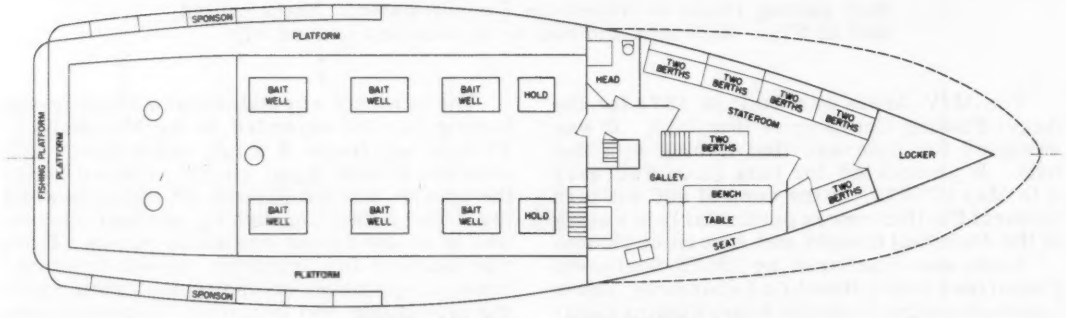

Fig. 2 - Main deck arrangement of 'Anela.'

the steel-hulled vessel has a cruising speed of 13.8 knots and a cruising range of 3,700 km. The registered length is 26.6 m., the beam 7.6 m., and the depth 3.6 m. Gross and net tonnages are 136 and 91 M.T., respectively. The vessel has a fuel-oil capacity of 56,775 liters and freshwater capacity of 11,355 liters.

Figure 2 shows Anela's deck arrangement. The six baitwells, equipped with pump-circulating systems, can hold as much as 160 buckets of bait. When emptied of bait, the baitwells serve as refrigerated fishholds with a fish-carrying capacity of about 77 M.T. Two forward holds are used to store provisions.

MARSHALL ISLANDS (FEB. 16-29)

Departing on the outward leg from Honolulu on February 8, Anela first stopped at Majuro in the Marshall Islands. These islands lie 3,700 km southwest of the Hawaiian Islands on a northwest-southeast axis from lat 15° to 5° N between long 162° and 173° E. The Marshalls make up one of six districts in the Trust Territory of the Pacific Islands, which is administered by the U.S. Department of Interior through a high commissioner headquartered at Saipan. The other districts are Palau, Yap, Truk, Ponape, and the Mariana Islands.

Rising not more than a few meters above sea level, the Marshalls consist of a double chain of coral atolls about 200 km apart. They have a total land area of about 180 km^2 and a lagoon area of about 11,650 km^2 (Mason, 1951). The chief island is Jaluit; along with several other islands in the Mariana and Caroline groups, it served as a base for Japanese pole-and-line skipjack fisheries prior to World War II. The present district administrative center is on Majuro, which has good accommodations for shipping (Tudor, 1968).

Baiting

Majuro has an irregularly oval lagoon that measures about 45 km long and 17 km wide (Fig. 3). Exploratory cruises of the NMFS 'Townsend Cromwell' had revealed that bait suitable for pole-and-line fishing was abundant at Majuro. Prior to baiting in Majuro Lagoon, we surveyed the lagoon side of the northern islets where schools of silverside, Pranesus pinguis, and sardine, Herklotsichthys punctatus, were reported to be abundant (Hida, 1971). Fair-to-good quantities of both species were seen schooled close to shore in shallow water, some over fairly good seining bottom, and some over rough, uneven bottom of coral sands and rubble interspersed with coral heads.

observation by an NMFS observer revealed that when the silverside were schooled in the same location as the sardine, the former always concentrated closer to the surface with the latter below.

Silverside and sardine, although considered by the crew to be inferior to the Hawaiian nehu, Stolephorus purpureus, as bait for skipjack fishing, nevertheless were satisfactory as tuna bait. Both species were vigorous in the seine and could be transferred from the seine to the baitwells and "crowded" (concentrated into a small, two-handled push net during chumming) without significant mortalities. Being hardy fish, silverside and sardine could be transported long distances without serious loss. For example, on the 6-day, 2,965-km

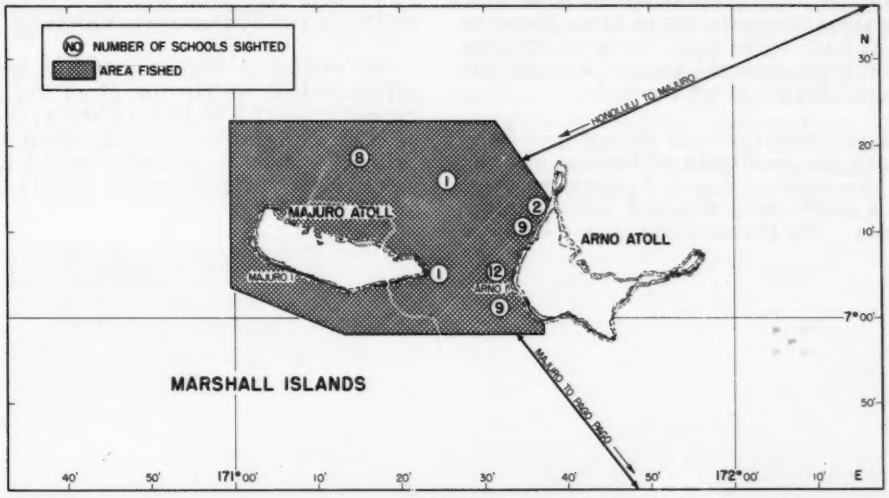

Fig. 3 - Number of schools sighted and the area fished by M/V 'Anela' in the Marshall Islands (February).

On our first stop in the Marshalls, the crew baited twice in Majuro Lagoon and caught 205 buckets of bait in five sets, which required 3.3 hr to complete. One bucket equals 3.2 kg of baitfish. The average catch rates were 62.1 buckets per hour and 41.0 buckets per set; these were far better than those calculated in a June-August 1967 study of Hawaiian skipjack vessels, whose crews averaged only 11.9 buckets per hour and 12.4 buckets per set. A large proportion of the Majuro baitfish was silverside, which ranged from 6.4 to 8.9 cm in total length. Smaller quantities of sardine, taken together with the silverside, ranged from 11.0 to 14.0 cm (T. Hida, personal communication). Underwater

voyage from the Marshalls to American Samoa, Anela carried about 50 buckets of bait with hardly any mortalities. While being transported, the bait were fed daily on a wet mixture of flaked, boiled skipjack and bread.

Fishing

While in the Marshalls in February, we concentrated our effort in waters immediately adjacent to Majuro and Arno atolls (See map). In 7 days of scouting and fishing, we sighted 42 schools, or an average of 6.0 schools per day. This was slightly better than the Hawaiian

vessels' average of 5.4 schools per day in June-August 1967 (Uchida and Sumida, 1971).

Of the 42 schools sighted, we identified 24: 18 skipjack, 3 mixed skipjack-yellowfin Thunnus albacares, 1 mixed skipjack-dolphin, Coryphaena hippurus, 1 rainbow runner, Elagatis bipinnulatus, and 1 mixed rainbow runner-skipjack-yellowfin-kawakawa, Euthynnus affinis. Eighteen schools were unidentified. All schools were found under bird flocks, which varied from 5 to over 1,000 birds. The flocks were composed predominantly of noddy terns, Anous stolidus, although sooty terns, Sterna fuscata, and white terns, Gygis alba, were also quite numerous.

Two large flocks of over 1,000 birds were sighted on the day we arrived in the Marshalls. Anela pursued both schools, which were close to shore along the west coast of Arno. Because we had no bait at the time, we used trolling lines and made several passes through the schools but did not catch any fish.

We experienced several days of good fishing despite the inevitable difficulties of fishing in a new region. Figure 4 shows the crew fishing a good-biting skipjack school in the Marshalls. We pursued and chummed 36 of the 42 schools sighted (86%) and successfully fished 18 (50%) of those chummed. The percentage of schools successfully fished is slightly lower than the 57% success calculated for schools fished in Hawaiian waters (Uchida and Sumida, 1971). We had 2 days when we were unable to catch any fish from the schools fished.

The catch included 3,369 skipjack tuna, 127 yellowfin tuna, 1 kawakawa, 2 rainbow runner, and 1 dolphin. In weight, the catch reached 20.0 M.T. of skipjack and 1.2 M.T. of yellowfin. Catch per day fished (including zero-catch days) was 3.5 M.T. of tuna, slightly higher than the 1967 summer average of 2.8 M.T. calculated for Hawaiian vessels. Ranging from less than 0.1 to 4.4 M.T., catch per school (including zero-catch schools) from 36 schools chummed averaged 0.5 M.T., or half the 1.1 M.T. average of Hawaiian vessels.

By randomly sampling 10 fish from each school fished, we found that the skipjack ranged from 1.6 to 10.6 kg and averaged 5.6 kg. Our data showed that only about 4% of the skipjack landed were less than 4.5 kg The yellowfin ranged from 5.6 to 13.6 kg and averaged 8.2 kg.

Fig. 4 - The crew of 'Anela' fishing a skipjack school in the Marshalls.

The catch per hook-minute, used here as a measure of the average rate at which fish were caught per hook per minute, ranged from 0.2 to 3.9 fish per hook-minute and averaged 1.1 fish per hook-minute.

Most schools pursued in the Marshalls were "subsurface," where no visible signs of surface movement were detected. We classified the schools as 20 "subsurface," 6 "jumping, " and 1 "boiler"(Scott, 1969). Of particular interest was the "boiler" sighted on February 20. When sighted from a distance, the bird flock of over 1,000 was "working" over what appeared to be breakers (Fig. 5). As it turned out, the "boiling" white water was due to hundreds of fish actively pursuing and feeding on prey at the surface. We made 24 passes through this mixed skipjack-yellowfin school. Seven passes produced no fish. From the remaining 17 passes, the catch varied from 1 to 62 fish. The reason for the small catch on each pass from this large school was that the fish responded to chumming at the stern only for short periods (1 to 11 minutes), then broke off and headed in another direction. The stomach contents of several landed fish, and the regurgitated material on deck, showed that the tuna were feeding on a small anchovy that closely resembled the Hawaiian nehu.

Environmental Conditions

In February, we had reasonably good weather in the Marshalls. The prevailing northeast trades, estimated from sea conditions to be blowing from 18 to 36 km/hr, were sufficiently strong most of the time to raise whitecaps on the blue water outside the lagoon. High winds and rough seas were responsible for the cancellation of only 2 days of fishing. Showers were frequent but brief and did not seriously hinder baiting or fishing.

From expendable bathythermograph (XBT) casts down to 400 m, we obtained data to construct frequency distributions of surface and subsurface temperatures at 100-m intervals (Fig. 6). Surface temperatures around Majuro and Arno were relatively warm with a narrow range from 27.5° to 28.5° C. At 100 m, the temperatures had a relatively wide range--from 21.3° to 27.0° C; but below that, they varied only slightly--ranges from 11.3° to 13.0° C at 200 m, 9.4° to 9.8° C at 300 m, and 8.6° to 8.9° at 400 m. The thermocline was distinct and occurred between 60 and 102 m.

Fig. 5 - A "boiler" school fished off Majuro atoll on February 20, 1972 by the crew of 'Anela.'

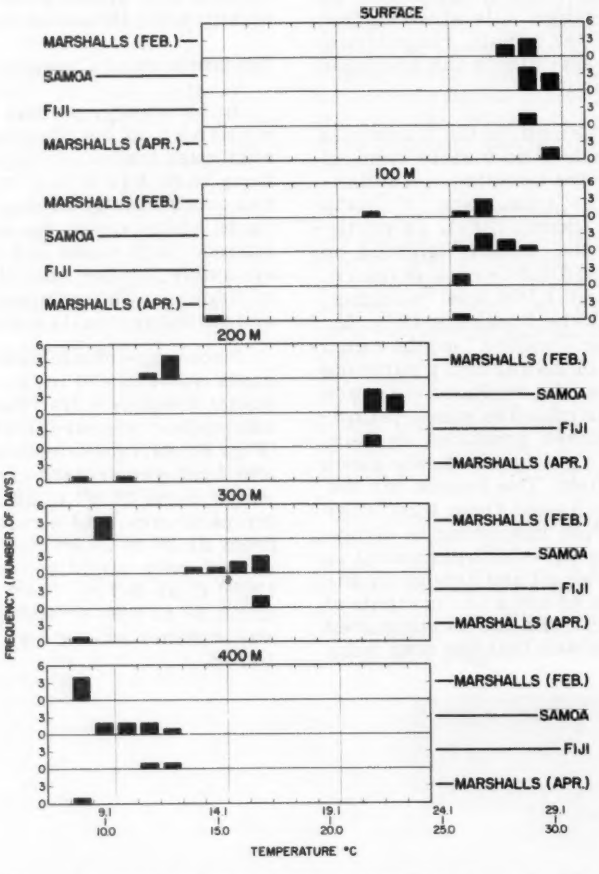

Fig. 6 - Frequency distribution of surface and subsurface temperatures of waters around Marshall Islands (February and April), Samoa, and Fiji, 'Anela' charter cruise, February 8-May 9, 1972.

SAMOA AND FIJI (MARCH 6-APRIL 15)

Anela left the Marshalls on February 29 and arrived at Pago Pago, American Samoa, on March 6. The trip was uneventful except for 1 day of fishing 74 km north-northeast of Apia, Western Samoa, on March 5.

American and Western Samoa are situated between lat 13° and 15° S and extend in an east-west direction from about long 168° to 173° W. They are volcanic in origin (Fig. 7). American Samoa comprises all the islands lying east of long 171° W and is administered by the United States. Pago Pago, on Tutuila, is the principal town and the harbor serves as a port of landing for foreign longline fishing vessels which supply the two American canneries with large, deep-swimming tunas. Western Samoa is a self-governing nation of the British Commonwealth. It has two large, main islands--Upolu and Savaii. The chief town and administrative center is Apia on Upolu.

Lying 925 km southwest of Samoa is Fiji. It comprises 320 islands of various sizes between lat 15° and 22° S and long 177° W and 175° E (Fig. 8). Two of the largest are Vanua Levu and Viti Levu, on which Suva, present capital, is located. Levuka, the former capital on Ovalau, serves as a port of landing for foreign longline fishing vessels. These unload frozen tuna for transshipment to canneries in the United States and Japan.

Baiting

American Samoa--Previous bait surveys by the NMFS 'Charles H. Gilbert' indicated that bait might be scarce in both American and Western Samoa (Hida, 1970). We spent 3 days looking for bait in American Samoa. We scouted from shore along the beaches of Fala Lagoon and Fagaitua Bay on Tutuila, and from the skiff along the perimeter of Pago Pago Harbor. We saw small schools of juvenile bigeye scad, Trachurops crumenophthalmus, along the beaches and sardine, jack, Caranx sp., and mullet, Mugil sp., in the harbor, but nowhere did we see baitfish in any quantity. We tried fishing with a 100-w light at night, but the amount of juvenile jack and bigeye scad that congregated around the light was hardly sufficient for tuna fishing by a vessel of Anela's size. We also attempted to scout Aoa, Masefau, Afono, Vatia, and Fagasa Bays, but rough seas prevented Anela from launching the skiff. Bait could not be found in American Samoa, so we decided to attempt baiting in Western Samoa.

Western Samoa--On March 10, we departed Pago Pago Harbor and arrived at Apia Harbor (Fig.7). We scouted intensively along harbor's perimeter and along northwestern shore near harbor's entrance. With exception of a small school of round herring, Spratelloides delicatulus, there were no other baitfish in appreciable quantity. Then we traveled to Asau Harbor on the northern coast of Savaii. There the crew scouted the harbor's perimeter without finding any bait. A night light was also set in an attempt to attract anchovy, which were reported to be in the harbor at times. Again, with the exception of a few jack and bigeye scad, we failed to attract any appreciable quantities of baitfish. Palauli Bay on the southern coast of Savaii also was suggested as a possible baiting ground. But the bay was very shallow and there was no assurance that bait could be found there, so we returned to Pago Pago on March 13. We arranged to depart for Fiji to catch bait. The lack of bait in Samoan waters was in marked contrast to the abundance of bait in Majuro Lagoon.

Fiji--The charter did not include operations near Fiji. However, because bait was lacking in Samoa, we obtained permission from the Government of Fiji to bait in Fijian waters; in return, we agreed to conduct a survey of tuna schools around Fiji. We departed Pago Pago on March 16 and arrived in Suva on March 20.

Runoff from a recent heavy rain had muddied much of the water in baiting grounds near Suva. Therefore, we traveled to Kia Island

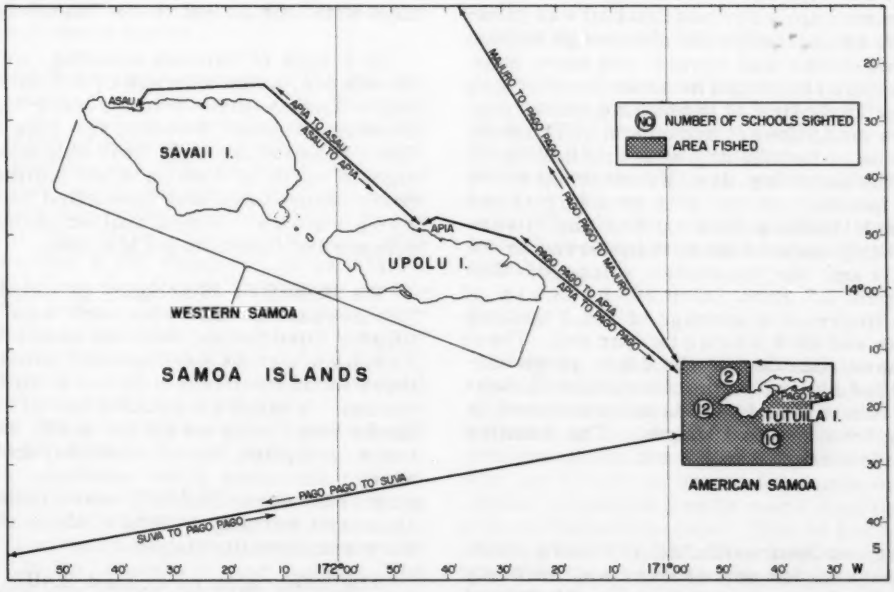

Fig. 7 - Number of schools sighted and the area fished by M/V 'Anela' in American and Western Samoa.

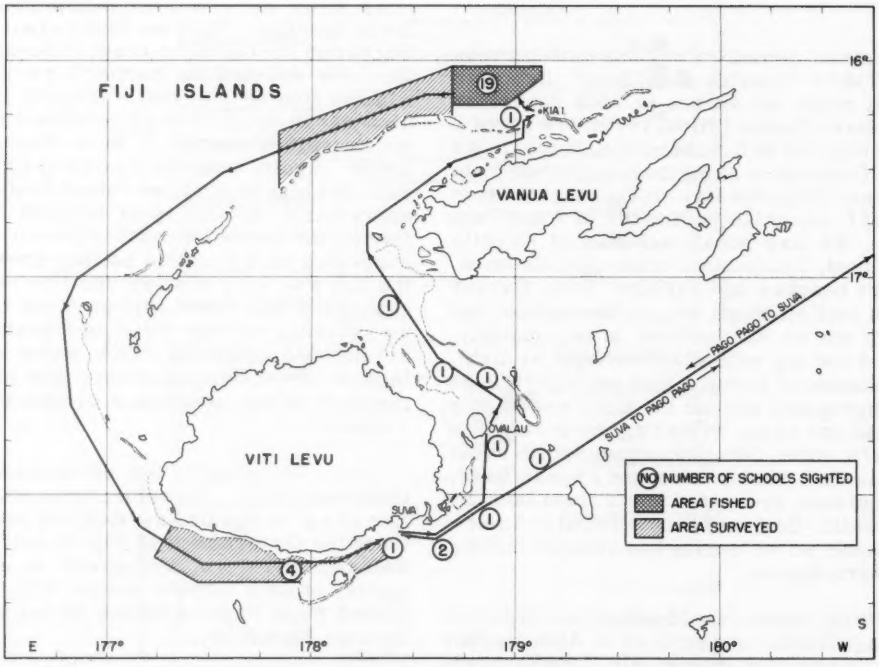

Fig. 8 - Number of schools sighted, area fished, and area surveyed by M/V 'Anela' in Fiji.

north of Vanua Levu and arrived there March 23 (Fig. 8). We surveyed the shoreline and it was immediately obvious that bait was plentiful. We saw bait schooled over rough bottom of jagged rocks and corals, and some over fairly smooth bottom near small, sandy beaches. In the first of two baiting operations, the crew made one set and caught 159 buckets of sardine. After fishing with this bait north of Kia the following day, we returned to the baiting ground. In two sets we caught an additional 110 buckets of sardine and silverside. Sixty buckets were transferred to the baitwells and the remainder released. The crew spent 1.7 hr to catch 269 buckets of bait, an impressive average of 158.2 buckets per hour and 89.7 buckets per set. These were more than double the catch rates calculated for baiting in the Marshalls in February. About 75% of the Kia bait were sardine ranging from 7.6 to 10.2 cm. The smaller silverside were 6.4 to 8.9 cm.

Fishing

American Samoa--Actual fishing time, only 3 days in Samoan waters, was severely limited by the more pressing need to travel between various baiting sites and by unavoidable delays ashore. We fished near Samoa 2 days with bait caught in the Marshalls.

In 4 days of Samoan scouting, we sighted 25 schools, or an average of 6.2 schools per day. Twenty-three schools were sighted as a result of direct scouting for tuna schools. The remaining two, both skipjack, were sighted north of Tutuila after baiting in the north shore bays was cancelled because of rough seas. Anela trolled through both schools but failed to get a strike.

We identified 16 schools as skipjack and 1 as kawakawa; the remainder was unidentified. Bird flocks over the tuna schools in Samoan waters were usually smaller than those found over tuna schools in the Marshalls. A large proportion of the bird flocks was composed of sooty and noddy terns, but white terns, boobies, and shearwaters also were quite common. Of the 25 schools seen, 21 (84%) were pursued and chummed, but only 8 (38%) of those chummed were successfully fished.

The total catch reached 2,407 skipjack weighing 12.1 M.T. and 33 kawakawa. Catch

per day fished averaged 4.0 M.T., slightly higher than that calculated for fishing in the Marshalls. Catch per school ranged from 0.2 to 3.7 M.T. and averaged 0.5 M.T. About half the Samoan schools were "subsurface"; the remainder was "jumping".

Compared with Marshalls skipjack, Samoan were usually smaller; about half (56%) were under 4.5 kg. Samoan skipjack ranged from 2.3 to 11.6 kg and averaged 5.3 kg.

The catch rates of schools fished in Samoa did not vary as widely as those calculated for schools fished in the Marshalls in February. They ranged from 0.2 to 2.0 fish per hook-minute, and averaged 0.9 fish per hook-minute. This was slightly below February average in the Marshalls.

Fiji--Tuna schools were numerous in Fijian waters. We sighted 3 schools en route to Suva, 8 schools en route to baiting ground at Kia Island, 19 schools in 2 days of fishing north of Kia, 4 schools at Mbengga Passage while returning to Suva, and 2 schools immediately after departing Suva for Pago Pago. Seventeen schools were identified as skipjack, the remainder unidentified.

Most flocks sighted in Fiji were large: 56% were composed of an estimated 101-500 birds. Noddy terns predominated in all flocks, although shearwaters and tropic birds were common in some flocks.

We sighted a daily average of 5.1 schools during scouting and fishing in Fiji. Eighteen (50%) of the schools sighted were pursued, and 16 (84%) of those pursued were chummed. Twelve schools, or 75%, of those chummed yielded fish, a percentage of success much higher than that calculated for schools fished in Hawaii, the Marshalls, and Samoa. The catch reached 6,227 skipjack, or 19.1 M.T., with catch per day fished averaging an impressive 9.6 M.T. This was more than twice the average catch per day in Samoa. Catch per school ranged from less than 0.1 to 3.8 M.T. and averaged 1.1 M.T. This was identical with that calculated for Hawaiian vessels--but twice the average catch from schools fished in the Marshalls and Samoa.

Ranging from 1.2 to 4.5 kg, and averaging only 2.9 kg, the skipjack caught near Fiji were considerably smaller than the fish caught in the Marshalls and Samoa. The small size was offset, in part, by high catch rates. These varied from 0.1 to 4.4 fish per hook-minute, and averaged 2.3 fish per hook-minute. We obtained good tonnages from most schools fished.

Environmental Conditions

In Samoan waters, Anela found reasonably good weather. Only one baiting attempt and 1 day's fishing were cancelled because of high winds and rough seas. The prevailing east or southeast winds blew at estimated speeds of 18 to 36 km per hour. Showers were frequent and varied from light to heavy, but these did not seriously hinder baiting or fishing. Around Fiji, the winds were either easterly or westerly, and blew from 9 to 28 km per hour. Frequent showers also were a feature of Fiji.

The surface temperatures around Samoa and Fiji were usually warmer than around the Marshalls; they ranged from 28.4° to 29.4° C. Expendable bathythermograph casts showed that the thermocline in the Samoa-Fiji area was rather indistinct; it varied from 43 to 96 m. At 100 m., the temperatures ranged from 27.5° to 28.5° C. At 200 m and below, the temperatures were considerable warmer than at similar depths around the Marshalls. They ranged from 21.2° to 22.8° C at 200 m, 14.0° to 17.0° C at 300 m, and 9.3° to 12.2° C at 400 m (Fig. 7).

MARSHALL ISLANDS (APRIL 23-MAY 2)

On the homeward leg, Anela retraced her path to the Marshalls. It departed Pago Pago on April 16 and arrived in Majuro on April 23 (Fig. 9). We felt it desirable to explore atolls other than Majuro and Arno for concentrations of tuna. We centered our efforts around Jaluit atoll and Kili Island and shifted to Majuro and Arno atolls before returning to Honolulu.

Baiting

Fishing rights in the Marshalls are controlled by local municipalities, the basic units of government on each island or atoll. Before proceeding to Jaluit to bait, we obtained permission from the district administrator in Majuro, who arranged for Anela to bait in Jaluit. Jaluit Lagoon is more than twice the size of Majuro Lagoon; it is 56 km long and 22 km wide (Fig. 9). After fishing near Jaluit and Kili, we returned to Majuro Lagoon to catch bait. Unlike February's baiting con-

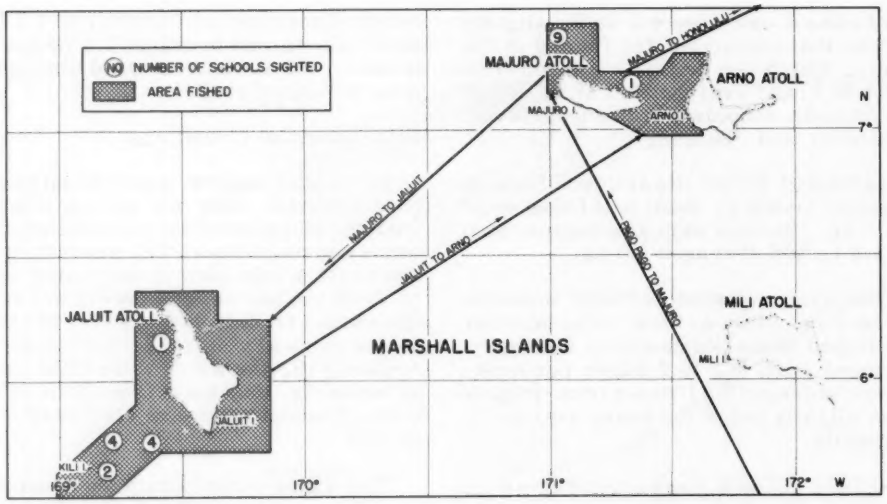

Fig. 9 - Number of schools sighted and area fished by M/V 'Anela' in the Marshall Islands (April).

ditions, we saw none along the shoreline. High winds and rain made visual scouting from the skiff extremely difficult and were partly responsible for our failure to see baitfish schools.

Overall, baiting at Jaluit and Majuro required 3.6 hr. In two sets in Jaluit Lagoon, the catch totaled 189 buckets, an average of 94.5 buckets per set. Catch per hour, which includes the Majuro effort, was 52.5 buckets. After filling baitwells, about 30 buckets of bait remaining in the seine were released. The catch was made on the lagoon side of the shoreline of Emidji island over relatively smooth sand bottom; it consisted almost entirely of sardine ranging from about 8.9 to 11.4 cm long.

Fishing

In April, Anela found Marshalls' conditions considerably changed. Perhaps most significant was size of bird flocks. In February, nearly half the flocks had more than 500 birds; in April, all flocks had 500 birds or fewer. However, there was no change in species composition: predominantly noddy terns, with few sooty and white terns. School sightings in April totaled 23 schools in 4 days, or an average of 5.8 schools per day. Of these, seven were skipjack, eight yellowfin, one mixed skipjack-yellowfin, and seven unidentified.

Ten of the schools sighted were pursued and chummed. Of these, only three (30%) were successfully fished, a rate considerably below February's. There were 3 zero-catch days in 4 days of fishing.

The crew caught 300 fish totaling 2.0 M.T. from two schools of skipjack. One school of yellowfin yielded 44 fish, which weighed 0.6 M.T. The catch per day was very low, averaging only 0.6 M.T., or about one-sixth average catch per day in February. Catch per school was similarly low; it ranged from 0.6 to 1.0 M.T. and averaged only 0.3 M.T.

Although a large proportion of schools pursued in February was "subsurface," the majority of schools pursued in April were "jumping." We had seven "jumping" schools, two "subsurface," and one "finning".

The size of skipjack caught in April did not vary as widely as in February. The April fish were medium-sized--between 5.9 and 7.5 kg and averaging 6.7 kg. For the one yellowfin school fished, the size range was 12.2 to 18.0 kg and the average 14.4 kg; this was considerably larger than February's average size of yellowfin. The catch rates calculated for the three schools fished in April varied between 0.3 and 0.5 fish per hook-minute, and averaged only 0.4 fish per hook-minute. The figure was less than half the catch rate of the February schools.

Environmental Conditions

On homeward leg, changes were evident in environmental conditions. Our weather observations showed that in April the northeast trades had diminished, and the winds had shifted to the east and southeast. The weather was exceptionally mild. Wind speeds were estimated at 9 to 28 km per hour but more frequently at lower speeds.

Surface temperatures, which ranged between 27.5° and 28.5° C in February, were slightly higher at 29.1° and 29.2° C in April. Very noticeable changes had occurred in subsurface layers, particularly in the depth to the top of the thermocline and in the temperature at 200 m (Fig. 6).

CONCLUSIONS

We believe that a commercial pole-and-line fishery for surface schooling skipjack and yellowfin tuna could become a reality and a source of revenue in the Marshall Islands. Not only were the potentials of the skipjack tuna resources impressive, but so were the potentials of the bait resource. The seasonal availability of tuna schools is not yet clearly understood and further studies are necessary. Likewise, stocks of sardine and silverside in the Marshalls need to be studied to determine how well they will withstand fishing pressure by commercial pole-and-line vessels.

Concerning American Samoa, we believe that it is premature to reach conclusions regarding a pole-and-line fishery there. Our limited observations and a previous NMFS survey of Samoan waters have shown that skipjack are present in sufficient quantities to support a commercial fishery at least large enough to meet all local demands. A vital prerequisite is the means of catching the tuna. Bait is scarce, but its seasonal distribution and abundance should be studied further.

We can conclude, tentatively, from our short stop in Fiji that skipjack schools, sighted at rate of 9.5 schools per day north of Kia Island, occur in sufficient numbers to support a small commercial fishery. But the short survey precludes conclusions about the abundance in other areas or in other times of the year in Fiji. Bait appears plentiful. From our observations and conversations with Fijian government observers, it is evident that many species of bait occur around the numerous islands of the Fiji group, and that day and night baiting are possible.

Tuna schools were found relatively close to all island groups surveyed. So a profitable tuna fishery in the Marshalls, Samoa, and Fiji could be based on small vessels of limited bait capacity and cruising range, such as those in Hawaiian waters. Shoreside support facilities for servicing the vessels and processing the catch are already well established in American Samoa and Fiji. Both service foreign longline vessels. The Marshalls, however, lack all such facilities.

ACKNOWLEDGMENTS

Many people worked hard to make this cruise a success. We thank Captain George K. Higashide and his crew for helping us adjust to life on a commercial fishing vessel and for contributing time and effort to help us collect data; Mr. Frank Goto of the United Fishing Agency and Mr. Jack Shinsato of Angel Fishing Company for providing administrative and logistical support; Senator Amata Kabua, President of the Congress of Micronesia, and Oscar de Brum, District Administrator, and their staffs in the Marshalls; Dr. Stanley Swerdloff, Director of the Office of Marine Resources, and his staff in American Samoa; the Government of Western Samoa, Mr. William Travis, Fisheries Officer of the Department of Agriculture, Forests, and Fisheries, and his staff; the Government of Fiji, Mr. B. Vunibobo, Secretary for Ministry of Agriculture, Forestry, and Fisheries; and Mr. Robert E.K.D. Lee, Manager of the FAO Local Tuna Project, and his staff.

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EUROPE

SOVIETS BUILD MACHINES TO PRODUCE KRILL PASTE

The Soviet Federal Research Institute of Fisheries and Oceanography (VNIRO) has built machines for production of a protein-rich paste from krill. Six have been installed aboard factory stern trawlers and one has been set up ashore to produce protein paste from Black Sea shrimp.

Each machine, operated by 2 people, has a processing capacity of 1 ton of fresh krill an hour (yielding about 250-300 kilograms of paste). The krill is pressed, coagulated, and the liquid protein portion separated. The protein paste is packed into blocks of either 250 grams or 3 kilograms.

SOVIETS EXPAND INTO ANTARCTICA

Announcement of the production of these machines for stern factory trawlers coincides with reports of a major Soviet expansion into untapped fishing grounds of the Antarctic. Krill, a shrimp-like crustacean of minute size, is abundant in that area. The maximum sustainable yield is estimated variously at 60 to 100 million tons annually. In February 1972, the Soviets announced the establishment of a permanent expedition to explore and exploit the fishery stocks of the Antarctic. As many as 7 Soviet factoryships were operating in the area of the Kerguelen Islands in the sub-Antarctic waters of the Indian Ocean. Estimating that a factoryship can service 10-15 trawlers, there were probably 70-100 Soviet vessels fishing in the area.

NEW SOVIET ENTERPRISE

In mid-October 1972 it was announced that a Fishery Association, 'Antarktika', had been established in Odessa. Its fleet includes the giant 'Vostok', world's largest fishery vessel; the whaling mothership 'Sovetskaia Ukraina'; several 'Atlantik'-class stern trawlers; and the "Grumant'-class stern trawler 'Van Gogh', which specializes in shrimp research and fishing. The value of the Association's 1972 gross output was planned to exceed 200 million rubles. The fleet's operation will be supported ashore by canneries, processing plants, and ship-repair yards in the Black Sea cities of Izmail, Kherson, Vilkovo, Il'ichevsk, and Odessa.

Species and Problems

Soviet sources do not indicate the species which will be the primary targets of the new fishery. In the past, they have been taking considerable amounts of notothenia, a cod-like species that does not inhabit waters warmer than 4 degrees centigrade. The huge krill resource, which literally can be scooped up, would appear to be the major object of the Soviet expedition.

Soviet sources say two major hurdles must be overcome before krill could be exploited on a large scale: processing and marketing. The first appears to be solved by the VNIRO machine. As for the other, various Soviet agencies (the Fisheries Ministry, VNIRO, the Ministry of Food Industry, among others) appear to be engaged in a major publicity and promotion campaign to sell krill paste and an allied product (cheese with krill paste). Recipes for the preparation of dishes with krill paste are being circulated in food stores. The Soviets are also examining the export potential.

NORTHWEST ATLANTIC FISHING OPERATIONS COMPUTERIZED

The Soviet Western Fisheries Administration (ZAPRYBA), headquartered at Riga, is setting up a data-processing center in which a Minsk-22 computer will process operational information from the 900-vessel fleet. Until now, data on catches, transshipments, processed products, fuel needs, supplies availability and requirements, sent daily by the captains of the ZAPRYBA vessels, have been handled manually by a large staff of specialists. The computer will cut down on time, and permit reduction of personnel. The Western Fisheries Administration hopes to save $900,000 annually when the computer center becomes operational.

RESEARCH NEW PACKING MATERIALS

The Soviet output of canned fishery products almost doubled during the past decade. Nevertheless, it represented barely 10.7% of total output of edible and non-edible fishery products, down from 12.2% in 1960. In 1970, total output was 4,562,000 metric tons.

USSR (Contd.):

So various agencies of the Soviet Ministry of Fisheries are researching and testing new materials for canning fish. A method of electrolytically tin-plating sheet steel, using only 7.5 kilograms of tin for 1 metric ton of plated sheet steel, reduces the cost. Other research has resulted in successful tests with plastic containers, which are considerably less expensive than metal cans. Tests have shown fish canned in plastic cans was undeteriorated 4 months after sealing. The use of glass containers for certain types of fishery products also will be increased.

ICE-REPELLING PAINT DEVELOPED

Icing is a serious threat to the safety of vessels fishing in northern waters. In the mid-1960's it caused 4 or 5 Soviet medium size trawlers to capsize in the Bering Sea. Nearly 100 fishermen were drowned.

For many years, the Soviets have tried to find solutions to the problem with various de-icing techniques, including chemicals, electrical heating devices, etc. Now specialists at the State Design Institute of the Fishing Fleet (GIPRORYBFLOT) and the Leningrad Poly-technical Institute have reportedly developed a special paint which repels or prevents formation of ice on hull and superstructures of vessels. The new paint is the result of several years' studies and experiments at the laboratories of Arctic and Antarctic Research Institute and on vessels in the Barents Sea. Commercial production is expected to begin soon.

DANISH COD FILLETS & BLOCKS EXPORTS TO U.S. QUINTUPLED

During the first nine months of 1972, the quantity of Danish cod fillets and blocks exported to the United States increased fivefold over the comparable period in 1970. The U.S. Regional Fisheries Attache in Copenhagen reported it reached a total of 52 million pounds valued at more than $23 million. This averaged 44 cents per pound, compared to 29 cents in 1970. Most of the increased exports to the United States came from the greater production of cod fillets and blocks resulting from exceptional cod fishing in the Baltic, and more favorable U.S. prices. Danish export of cod fillets and blocks to all countries totaled nearly 77 million pounds, of which 68 percent was shipped to the U.S. In 1970, the United States took only 27 percent of a much smaller quantity.

SWEDISH FISHERIES DECLINE IN 1971

The total catch of the Swedish sea-fishery industry in 1971 was 227,629 metric tons (round fresh weight), a decline of 20 percent from 1970. This was mainly because of smaller catches of industrial fish (herring and other fish for reduction to fish meal and oil). The sea herring and Baltic herring catch for human consumption remained at about the same level as in 1970, approximately 39 percent of the entire catch. About 100,000 tons of the catch was landed in other countries (mainly Denmark). By far the bulk of the catch in 1971 was herring and cod.

Sweden ranks 13th among fishing nations in Europe. The catch has been trending downward since 1964, when it totaled 375,000 tons; so too have the numbers of fishermen and vessels. To counteract lower domestic landings, imports are rising.

Imports Increase

Swedish imports of fish products were about 5 percent greater than in 1970--reaching 199,000 metric tons valued at US$ 109 million. Principal items imported were fish meal, fish oil, fresh, frozen and conserved fish. Norway, Denmark, and the United States were the leading suppliers. Swedish exports were small, when landings by Swedish fishermen abroad were excluded.

Fish consumption in Sweden is high compared to many other developed countries. Since 1965, consumption seems to have remained fairly constant. Use of frozen fish increased at the expense of fresh fish.

NORWAY'S FISH FARMING GROWS

A/S Mowi of Bergen, one of the leading commercial salmon breeders, marketed 60 tons of fresh (chilled) salmon in 1971. It hopes to increase its output to 1,500 metric tons and US$4.6 million within a few years. Mowi has a hatching capacity for 2 million fry. There is a capacity for 300,000 smolt. Mowi's two salt-water plants have a combined capacity for 500 tons of salmon.

Salmon roe comes from Mowi's own stocks. Fry are raised in fresh-water tanks. They are fed to speed up growth. About 80 percent of Mowi's fry reach the smolt stage in 1 year. The normal time is 2-4 years. When the smolt stage is reached, the salmon are placed in salt-water plants, where they grow to 12-16 pounds.

Aquaculture Advances

Aquaculture is a growing industry in Norway. A fish farm on the island of Hitra has been successful in raising salmon in 3 years by using capelin for feed. Prices for salmon have reached as high as US$9.21 per kilo, and average $3.84 per kilo. Fish-breeding experiments aimed at developing marketable strains of salmon and trout are being conducted in Sunndalsora. The purpose of the experiments is to have fish from several generations on hand in order to have a wide selection for breeding of fish strains.

Fish farming began in the 1950's in Norway. The 1972 crop was expected to reach 1,500 tons, mostly salmon and trout. The projected annual growth rate for Norwegian fish farming is 15-20 percent, with an estimated 20,000-ton crop anticipated by 1990.

Fish farming may have increasing economic importance in Norway, where at present 70-80 fish farms are operating. Most of these are concentrated in the Sunnmore area. It is expected that both the fish farmers, and the suppliers of feed to the fish farms, will profit. ('News of Norway'.)

COOPS FOSTER FISHING IN IRELAND'S COUNTY DONEGAL

A very positive, progressive attitude toward the fishing industry exists in County Donegal in northwestern Ireland. Strong cooperative movements are responsible for much of the progress in the three major ports, Killybegs, Burtonport, and Greencastle. These ports produce better than one-third of Ireland's total seafish landings. There has been large investment and reinvestment in both the primary and processing sectors of the fishing industry. Donegal fishermen are learning to employ modern fishing, navigating, and processing techniques.

Continued Growth in Killybegs

Killybegs, the largest port in County Donegal, continues to grow. The fleet has increased to more than 50 vessels, most of which are over 70 feet long. The value of landings has increased to more than US$2 million annually. There are several operational fish-processing plants and a fish-meal plant. Salted and spiced herring worth US $370,000 are exported to Scandinavia.

Burtonport, though less developed than Killybegs, has a US$452,000 harbor improvement project and three processing plants which prepare the bulk of landings for export. Sixty-five vessels operate out of Burtonport. In 1971 they landed fish worth US$760,000.

Greencastle, a much smaller port, cannot handle larger fishing boats without dredging and other harbor improvements. Its primary product is excellent-quality white fish, most of which is shipped to Britain. Landings are worth more than US$370,000 per year.

Fishing Industry Quarter of Economy

The fishing industry accounts for about 25 percent of County Donegal's economy. The most important fish is herring, salmon is next. Almost all landed are exported. Haddock and whiting, both fresh and frozen, are sold on the Irish market.

Continuing rapid improvements and modernization of the fishing fleets and harbors bode extremely well for the future of this Donegal industry. Among the important developments is Irish entry into the European Community. Access to EC markets should prove profitable to Irish fishermen.

IRELAND (Contd):

IRISH CRAB FISHING GAINS IMPORTANCE

Crab fishing in Ireland has increased steadily in importance, according to 'The Irish Skipper', January 1973. This growth is reflected in the annual landings, which have risen from 38 tons in 1967 to 900 tons in 1971.

Fluctuating landings from the crawfish and lobster fisheries in some areas, and an increasing demand for crabs by the processing factories, have contributed to a greater emphasis on fishing for crabs. Preliminary figures for the present season show that the high level of landings has been maintained and, in certain areas, the interest in crab fishing has expanded.

The Northern Region

The north and north-west coastal areas proved to be the most lucrative crabbing grounds during 1972. The landings from these regions were almost double those of the previous year. They accounted for over half the total landing in the country. The principal fishing grounds were off the Inishowen and Fanad Peninsulas in north Donegal, and along the north Mayo coastline.

The former region yielded almost 300 tons of crab, and the latter over 250 tons. Crabs were not landed in any quantity from north Donegal before mid-August, because of involvement in the salmon fishery, yet landings were three times greater than in the corresponding period in 1971. The majority of traps used in this fishery were creels, but bait often proved to be a problem. Potting time was reduced occasionally as fishermen were required to hand-line for sufficient quantities of fresh bait.

In north Mayo, the fishing effort for crabs also was intensified. Estimated landings were substantially higher than the previous year. The majority of traps used were French barrel pots which, in some areas, were shot and hauled up to five times a day. Again, supplies of fresh bait caused problems in certain ports with the use of trammel nets.

The demand for the landed catches from north Donegal increased towards the end of the season when a new processing plant commenced operating in Carndonagh, on the Inishowen Peninsula. Most of the crabs from the north and north-west were processed for export to the United States, Sweden, and also Great Britain.

The West Coast

Crab fishing on the west coast was less productive than in previous years, even though the scarcity of lobsters encouraged some fishermen to pot for crabs. The salmon fishery took preference over the shell fishery in most areas in mid-summer but, after this, several vessels fished full-time on the crab stocks.

Landings in the South

The crab fishery in the south-west also proved to be less lucrative than in former years. Total landings fell to an estimated 188 tons--less than half the previous year's landings. The increasing interest in salmon fishing in the area may have accounted for some reduction in the crab fishery.

In the south-east of Ireland, the landings were comparable with those recorded in 1971. In Kilmore Quay, however, a crawfish fishery using tangle nets was successfully introduced. It had the effect of reducing the number of pots in the crab and lobster fisheries.

Crabs Support Expanding Fishery

The crab fishery in Ireland appears to be well established. In some areas, it is taking precedence over other types of fishing. Full-time crabbing has been shown to be a viable proposition, and potential of the industry is considered good. Although the major fishery in the south-west proved disappointing this year, the poor catch rates are probably attributable more to biological and environmental fluctuations than to over-fishing.

Some coastal areas, for example in north-west and west Donegal, have as yet remained underexploited, even though the resource is believed to be present in commercial quantities. Any further increase in landings, either from the established fishing grounds or from new areas, would help maintain the expanding level of production achieved over the last five years.

ARGENTINA HAS FISHERY INVESTMENT OPPORTUNITIES

Argentina's largely dormant fishing industry is to be stimulated by the Argentine Ministry of Agriculture and Animal Husbandry. The Banco Nacional de Desarrollo will provide about US$2 million per year for the next several years for improvements. There are to be new fishing boats operating out of Puerto Madryn and Mar del Plata, and the fish landing and handline facilities at Mar del Plata will be renovated.

Sixteen new fishing vessels are presently under construction in Argentina with a total fish capacity of 36,000 metric tons. The Ministry has also authorized the entry of 14 foreign fishing vessels with a capacity of 103,000 tons. The chief aim of the plan is to increase exports to Europe to $10 million from the US$2 million in 1971. In a corollary measure, taxes on foreign vessels fishing in Argentina waters were raised from US$70 per ton to US$200 per DWT.

British Trawler Can Fish

Authorization has been given for the British trawler 'Boston Lincoln' to operate off the Argentina coast for hake and other high quality white fish. They will be frozen into fish blocks at sea. The British project is initially to cost US$3.6 million. Eventually it is to develop into a 15-vessel fleet with a shore-based processing plant in Patagonia. Products are to be exported primarily to Western Europe. Exports will be handled by Marexport, Buenos Aires.

Patagonia's Offshore Waters Rich

The Argentine fishing industry does not fully utilize the extensive fishing potential of the Argentine continental shelf. The region off the Patagonian coast is considered one of the riches undeveloped fish resources in the world. The Argentine government financial ais shows a seriousness in developing this resource. Expanding exports will bring into Argentina much needed foreign exchange and provide employment in areas of underdevelopment.

United States fishing interests wishing to investigate the opportunities should contact the United States Embassy, Buenos Aires, Argentina, for information on specific conditions and contacts.

MEXICO'S FISHERY PRODUCTS GAIN

For the first half of 1972, Mexico's fishery production showed a slight gain of 5.5 percent over the same period in 1971--a total of 149,848 metric tons. About 75% of this total was for food purposes, the rest for industrial uses.

Among the edible species, mackerel registered the largest gain, 62.4 percent. Another large gainer was tuna, up by 30.5 percent to 3,843 tons. This reflects the recently increased efforts by Mexico to expand its tuna industry. The drop of 99.6 percent in the catch of turtles is a result of Mexico's total prohibition on catching these species.

Shrimp Continues Upward

Production of shrimp, the most important species from a value standpoint, continued its upward trend of recent months. A total of 17,206 metric tons shows a gain of 18.1 percent over the corresponding period the year before. Indications were that 1972 would prove to be a record year for shrimp production in Mexico. Shrimp exports, most of which went to the U.S., were 12,563 metric tons, 19.5 percent over the previous year. The value of exports was US$28.2 million, an increase of 29.3 percent over the corresponding period in 1971.

Fish Meal Steady

Among industrial products, fish meal production remained about steady at just over 12,000 tons. Imports of fish meal were down about 10 percent, for a total of 52,042 tons. Since most of these imports come from Peru, where there is a shortage in supplies to the fish meal industry, it is likely these imports will drop even further.

AFRICA

S. AFRICA USES FIRE CRACKERS TO SCARE OFF SEALS

The South African purse-seine fisheries have long been plagued by seals. Seals leap into seines by the hundreds. They feed, scatter the fish, and damage the nets. Fishermen, in frustration, have turned to shooting them despite strict regulations prohibiting their killing.

There are about 100 purse seiners in the South African fleet. Fishery officials became alarmed when they discovered that one Walvis Bay store alone reported sales of 60,000 rounds of ammunition per month to fishermen. Because of the great potential harm to the seal, South Africa's Division of Sea Fisheries began testing ways of controlling this marine animal.

Fireworks Against Seals

During a two-week period in September, fishery technologists used firecrackers--or cherry bombs--to scare the seals out of the nets. The results appeared favorable. About ten firecrackers succeeded in scaring off the seals for the duration of the pursing operations, and they showed no signs of growing accustomed to the noise. It is hoped that industrywide use of firecrackers will succeed in permanently frightening away seals. Further tests will have to be conducted before a final decision is made. ('South African Shipping News and Fishing Industry Review')

MEETINGS

Fifth International Congress, Fondation Francaise D'Etudes Nordiques

La Havre, France. May 2-5, 1973

Subject: "Arctic Oil and Gas: Problems and Possibilities."

"A discussion of the leading scientific, technological, ecological, economic, financial and human problems" with which mankind is faced.

Papers, reports, and discussions will be published after the Congress.

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World Fishing Exhibition

Vigo, Spain, September 12-19, 1973

Subject: "Marine Engines, Fishing Gear Processors and Equipment."

Commercial Exhibitions & Publications Ltd., Riverside House, Woolwich-London, is holding its 6th biennial World Fishing Exhibit. Fifteen major countries will participate. The area covers 56,620 square meters. There will be 4 large halls, open-air display space, and harbor area for visiting demonstration vessels.

ASIA

JAPAN

PROPOSED FISHERY BUDGET FY 1973 IS UP 30% OVER 1972

The Japanese Government, on January 15, 1973, approved the Fisheries Agency's budget request totaling 85,265 million yen (US$276.8 million, based on official exchange rate of ¥308 = US$1) for fiscal year 1973 (April 1973-March 1974). Pending approval by the National Diet (parliament), this will be an increase of 30.4 percent over the FY 1972 budget.

Promote International Cooperation

The budget request given top priority was 2,211 million yen ($7.2 million) for establishment of a private non-profit organization to promote international cooperation for protection of Japanese fishing activities off foreign coasts. This program was approved as an alternative to the Agency's earlier proposal for an International Fisheries Cooperative Agency. The funds for this program will be used to provide interest-free and low-interest loans to fishing industry groups extending economic assistance to foreign countries. The new organization is likely to be established in April. Another major item in the fishery budget is the fifth 5-year fishing port improvement plan, for which a total expenditure of 750 billion yen ($2.4 billion) for FY 1973-77 and 50,327 million yen ($163.3 million) for FY 1973 was approved. ('Suisan Shimbun', Jan. 17, 1973.)

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FORESEE FISH SHORTAGE IN 1980

The Japan Fishery Industries Federation has released a report projecting the country's yearly demand for fish as reaching 13.7 million tons by 1980. It also foresees total supply (including imports) as reaching 13.3 million, a shortage of about 360,000 tons. Of the shortage, 350,000 tons are expect to be tuna, seabream, and lobster.

As a result, the Japanese feel substantial price rises on marine products cannot be avoided in the future. The picture is expected to be clouded by declining demand for relatively cheap fish, whose prices will decrease. The report concludes that beef products will become increasingly more important to the Japanese diet in the coming years. ('Yomiuri')

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FROZEN TUNA EXPORTS REGULATED VOLUNTARILY

The Japanese Ministry of International Trade and Industry (MITI), to avoid another yen revaluation, adopted an export control ordinance. Subject to control were items that recorded an export value exceeding US$100 million during August 1971-July 1972, and which showed substantial increase in sales during January-July 1972. Among the items under those criteria were fresh and frozen fish products. Following negotiations between the Fisheries Agency and MITI, an agreement was reached to exclude from control all species excepting tuna, which comprised the bulk of the fresh and frozen fishery exports. Frozen tuna export regulation will be implemented voluntarily by the Japan Export Frozen Tuna Producers Association. It plans to hold down the rate of increase of frozen tuna exports during January-August 1973 to one-half the rate of increase during the same period in 1972. ('Suisan Tsushin' and 'Minato Shimbun'.)

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SQUID INDUSTRY FACES BANKRUPTCY

Nagasaki Prefecture is Japan's second most important "surume" (dried squid) producing center. In 1971, it processed $8 million worth. This was a poor year in terms of squid landings and market prices were high. Last year, several major dried-squid producers decided to speculate; they assumed poor catches and higher prices would recur. They were mistaken. Landings were very good and prices declined.

On October 7, 1972, the Tenwa Bussan Company, one of Japan's larger "surume" dealers, declared bankruptcy with a total debt of $7 million. Shortly thereafter, the Ohshio Surume Company in Kure City declared bankruptcy with a debt of $27 million. Previously, this company had produced 30 percent of all "surume" in Japan.

JAPAN (Contd.):

Chain Reaction

These two disasters sparked a chain reaction of bankruptcies throughout Japan. Five firms in Osaka, a firm in Kobe, and one in Ohata fell victim. One or two companies in Nagoya and Hiroshima, and eight companies in Hakodata, are reported in danger of bankruptcy. Now, the suspension of auctions for "surume" in various parts of Japan threatens the livelihood of squid fishermen throughout the country. ('Suisan Keizai')

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TWO FIRMS TO BUY
U. S. SHRIMP TRAWLERS

Two Japanese firms, scheduled to be established shortly for shrimp fishing off the Guianas, north of Brazil, are planning to order 13 shrimp trawlers from U.S. boatyards. They are "Japan Distant-water Fisheries Company," which reportedly is scheduled to have eight 100-ton-class trawlers built by Atlantic Marine, Inc. at a cost of 53.4 million yen (approx. US$178,000) per vessel, and "Guiana Marine Products Company," which plans to order five similar-sized trawlers from a U.S. yard at a cost of 54 million yen (approx. $180,000) per vessel.

Fleet Off Guianas

These are two of the four groups of fishery firms tentatively authorized by the Japanese Fisheries Agency to operate 31 of the 52 additional vessels to be licensed for working off the Guianas. At present, 70 licensed shrimp trawlers, belonging to seven Japanese firms, are fishing in that region. Under the Agency's fleet buildup plan these 7 firms will be permitted a total of 21 additional trawlers. ('Suisan Tushin', Dec. 8 & 14, 1972.)

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TAIYO BUYS N. KOREAN
FISHERY PRODUCTS

Taiyo Fishery Company of Japan was scheduled to negotiate with the North Korean Marine Products Import-Export Company for conclusion of a long-term fish-purchasing contract. The Japanese firm has been importing fishery products annually through a trading firm. Included were sea-urchin roe, yellowtail, and squid worth 5 million yen (US$1.67 million). Now Taiyo wants to transact business directly. It plans to offer North Korea technical assistance in fish processing, and will send a refrigerated carrier vessel to that country if the contract materializes. Tokyo Maruichi Shoji trading firm has already concluded a long-term import contract with North Korea and is now purchasing fishery products on a trial basis. ('Suisan Tsushin')

SOUTH KOREA

BUILDING FISHING PORT AT ULSAN

The Republic of Korea's (ROK) Construction Ministry disclosed plans to spend 1,800 million won (approx. US$4.5 million) to build a fishing port at Ulsan (northeast of Pusan). It will be the largest fishing base in the country and will accommodate her growing distant-water fleet.

In 1972 forty distant-water trawlers landed in Pusan about 150,000 metric tons of fish from the North Pacific. This port has reached its maximum fish handling capacity. It necessitates construction of another base of operation.

Present plans for Ulsan include dredging and building a breakwater and wharves to permit simultaneous docking of two 3,500-ton-class and six 500-ton-class vessels. Fish processing plants will also be built at that port for annual production of 50,000 tons of frozen fish. ('Minato Shimbun')

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FISHING VESSELS
TO BE BUILT AT HOME

By 1976, The Republic of Korea (ROK) plans to build a total of 282 distant-water fishing vessels (154,600 gross tons) in domestic shipyards. Presently, vessels of this type must be purchased from foreign countries. To increase production efficiency and improve the international competitiveness of the ROK shipbuilding industry, small shipyards are being merged with larger ones. ('Suisan Keizai Shimbun')

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S. KOREA (Contd.):

ROK SEEKS OVERSEAS FISHERY AGREEMENTS

To safeguard Korean fishing operations off foreign coasts, the Republic of Korea (ROK) plans to enter into fishery agreements with 19 countries. Negotiations are now under way with six: Spain, Indonesia, Sri Lanka, Peru, Guiana, and Uruguay.

Working-level talks with Spain are expected to produce a formal agreement for: 1) joint construction of a 6,000-ton cold storage at Las Palmas; 2) other construction, including a minor ship-repair facility, a dispensary for Korean fishermen, and a bonded warehouse for ship supplies; 3) cooperative eel cultivation; and 4) exchange of information.

Other countries with which ROK plans to conclude bilateral pacts are Canada, Australia, New Zealand, Vietnam, India, Mauritius (in Indian Ocean), El Salvador, Nicaragua, Haiti, Ivory Coast, Algeria, Morocco, and Mauritania.

May Rival Japanese

The Koreans, with strong government backing, are aggressively moving forward to secure their fishing grounds. They are likely to become formidable rivals to the Japanese distant-water fishery operators. ('Suisan Keizai Shimbun', Jan. 17, 1973.)

* * *

POLE-AND-LINE SKIPJACK VESSELS TO BE BOUGHT FROM JAPAN

The South Korean Koryo Distant-Water Fishing Company signed a contract with the Japanese trading firm Mitsubishi Shoji to buy two large pole-and-line skipjack vessels. Each is 434 gross tons and scheduled for completion in May or June 1973. This action is the first time a private Korean firm has ordered such vessels from Japan. Koryo's venture, if successful, is likely to attract other Korean firms into the pole-and-line skipjack fishery. ('Katsuo-maguro Tsushin', Dec. 20, 1972.)

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ROK LIFTS BAN ON IMPORT OF USED JAPANESE FISHING VESSELS

The Republic of Korea (ROK) announced on January 15, 1973, that effective immediately it will permit the importation of used fishing vessels from Japan. This policy removes the ban imposed in February 1972. The ROK Government will permit imports of Japanese vessels needed for: 1) distant-water fishing; 2) transportation and shipboard processing of fish catches; and 3) development of new fishing grounds and training in fishery technology. ('Shin Suisan Shimbun Sokuho', Jan. 17, 1973.)

AUSTRALIAN FISHERY EXPORTS SET RECORD

Australian fishery exports were a record US$87.3 million in FY 1971-72 (twelve months ending in June). Rock lobster tail exports were 10.3 million pounds worth a record US$39 million; these were increases of 5 percent and 22 percent, respectively. Almost the entire quantity was exported to the United States.

Prawn exports set records for both volume and value--17.7 million pounds (up 19 percent) valued at US$31.4 (up 54 percent). Exports of prawn to Japan dropped from 78 to 67 percent of the total. Exports of prawn to the United States were 16 percent, and the United Kingdom 7 percent of the total.

Abalone & Scallop

Exports of abalone increased 30 percent to US$9.8 million. Canned abalone exports were 5.5 million pounds valued at US$6.8 million, while frozen abalone exports increased to 2.4 million pounds and US$3.0 million.

Scallop exports dropped 4 percent in volume to 2.1 million pounds but increased 5 percent in value to US$2.8 million. The United States bought 54 percent of Australia's scallop exports, taking 1.1 million pounds worth US$1.5 million, increases of 83 and 114 percent, respectively.

Industry Growth Predicted

The Commonwealth Minister for Primary Industry predicts that the Australian fishing industry will continue to grow, although probably at a slower rate than in recent years. Exports increased by 21 percent in FY 1971-72. The brightest feature of the year was the enormous increase in the prawn industry. The Minister warned against excessive optimism, stating that most of the prawn production comes from northern Australia, where catches are subject to wide fluctuations.

Among Australian fishermen there is increasing confidence in the future of the industry. More sophisticated vessels are being built, as are modern plants and ancillary services. There is now a solid core of experienced, dedicated personnel in the industry.

Progress in the 5 years ending June 1971 was rapid, with production up 60 percent, and exports more than doubled. The Australian fleet exceeded 9,000 vessels by June 1971, with 46 vessels more than 85 feet in length--compared with only 15 over 85 feet in 1966. Fishing personnel has increased by more than 3,000 to over 16,000.

Industry Consolidation Ahead

The Minister expects the next 5 years to be a period of consolidation of the industry. Emphasis will be on developing fisheries in remote areas and on exploring mid-water pelagic resources. To increase the supply of fish in local markets, these projects are necessary. Consumption has risen significantly, but only half the fish sold is caught locally and only 21 percent is fresh

In order to finance increases in the industry, a grant of $108,000 has been awarded for exploration into a possible jack mackerel purse-seining fishery; a grant of $109,000 was made for a shark fishery. ('Australian Fisheries')

"Fish and Shellfish Farming in Coastal Waters," by P.H. Milne. Published by Fishing News (Books) Ltd. 23 Rosemount Ave., London, England. $ 18.53.

The increasing alarm about over-exploitation of world fisheries makes this a very timely book. All over the globe there is interest in fish farming as a possible solution.

The author engages the problems and successes in a volume filled with information. He surveys fish and other marine species suitable for farming. Chapters cover design and construction of hatcheries, ponds, raceways, and tanks--and their aquatic and equipment requirements. New material and techniques are discussed. Legal aspects, choice of site, and material are considered. Chapters are devoted to the many difficulties the fish farmer encounters: control of predators, marine pollution, and the effects of marine enclosures on environment. Some facts justify hope--e.g., lobsters commercially grown in heated water attain marketable size in 3 years compared to 5 years in the sea.

Dr. Milne is a specialist in surveying and site evaluation, coastal engineering, applied oceanography, and marine farming. He is consultant and advisor to British fishing agencies.

Many pictures and diagrams are included. Also, there are many usable references, and appendices on wind, wave forces, tidal currents, mesh net design criteria, and pile design calculations. It can be a valuable aid to anyone interested in sea farming for profit.

FISHING GEAR

"FAO Catalogue of Fishing Gear Designs," published by arrangement with Food and Agriculture Organization of the United Nations by Fishing News (Books) Ltd. 23 Rosemount Ave., London EC4A 2 JL, England. $ 12.35.

Fishermen around the world can find valuable use for this book. It includes 80 designs of nets and rigging that have proved successful in the principal world fisheries.

Full explanatory matter is given concisely in 3 languages. A series of appendices covers a wide range of basic information: abbreviations and symbols used for designs, equivalents and conversions, trade names of synthetic fibers and examples of synthetic fiber ropes, common netting yarns, cutting rates and taper ratios, and an extensive glossary of fishing gear terms.

The designs themselves are so skillfully drawn that anyone using the explanatory text can easily read and interpret them. They are ranged in sequence of horse powers used for towing. Fishermen will be able to test comparable equipment efficiency and adapt it to local conditions.

Trawl nets are diagrammed. Purse seines, lift and tangle nets, gillnets and pots, dredge, longline and troll line are depicted. Designs are uncluttered and uncrowded, details and figures are very clear, translations do not dominate the page.

One important sideline of the Catalogue, which is an update of a 1965 issue, "is the promotion of international standardization of fishing gear specifications which is the prerequisite for efficient worldwide exchange of knowledge and experience."

ENVIRONMENTAL SCIENCE

"Nutrients in Natural Waters," edited by Herbert E. Allen and James R. Kramer. A Wiley-Interscience Publication, John Wiley & Sons, New York, London, Sydney, Toronto.

A new volume in the series 'Environmental Science and Technology', it presents the latest thinking and research on nutrients by experts

in the chemical and biological sciences and in engineering.

With one exception, all chapters are adapted by the authors from papers presented in the symposium at the National Meeting of the American Chemical Society in Los Angeles, March 28-29, 1971. Subjects include "Chemical Analysis of Nutrients," "Detergent Developments and Their Impact on Water Quality," "Bioassay Analysis of Nutrient Availability," "Oxygen-Nutrient Relationship within the Central Basin of Lake Erie." They cover chemistry, biochemistry, and geochemistry of nutrients.

Chapters I, II, and III deal with the 3 principal nutrients--nitrogen, phosphorous, and carbon. Chapters VIII, IX, and X detail research in the Great Lakes.

Succeeding chapters consider nutrient removal from wastewater by physical-chemical processes and biological treatment methods. Since data accumulated during the past 20 years indicate eutrophication is caused primarily by greater discharges of phosphorous, the book discusses phosphorous control by aluminum and iron salts, lime, etc. Nitrogen removal is examined. Biological methods for removing detrimental nutrients are presented.

Chapters touch on U.S. and Canadian government controls of nutrients in water.

There are many charts, tables, formulas, and references.

"It seems clear that if we are to preserve for future generations some semblance of biological order--science and technology must quickly come to play a dominant role in designing our social and industrial structure for tomorrow," the editors state. They have done creditable service in collecting the work of experts on nutrients in natural waters. It is an authoritative book that will prove useful for career or graduate-level reading.

MARINE TECHNICIAN'S HANDBOOKS

The University of California's Institute of Marine Resources offers a series of manuals covering a variety of ocean-related subjects.

Manuals such as these have been in use by Scripps Institute of Oceanography personnel for many years. They are now being made available to others who are interested. Scientists and technicians who secured and processed the data for Scripps are the ones preparing the manuals. This assures the user that working descriptions of techniques and equipment are authentic, that variables such as weather and sea conditions are included.

These are a few of the titles offered:

Oxygen Analysis
Phosphate Analysis
Gravity Coring
Procedures for Shipboard Diving, & University Guide for Diving Safety
The Sonar Pinger
Thermometry
Under Water Camera, Wire Lowered

Each manual is revised and updated to reflect the newest techniques.

For the technicians or scientists interested in professional data on oceanographic methods, this could be a good way to build a library of helpful handbooks.

To order any of the above at $1.25 each, or for information on others published, contact Institute of Marine Resources, P.O. Box 109, La Jolla, California 92037.

WORLD FISHERIES EXAMINED

"World Fisheries Policy: Multidisciplinary Views," published by the University of Washington Press. $9.50.

This is a 340-page, illustrated book that sheds new light on the problems and potentials of the world's fisheries. It seeks to evaluate the effectiveness of past fishery policies and outline concepts and attitudes that may shape future policies. The book is a result of a series of interdisciplinary seminars sponsored by the Graduate School of Public Affairs at the University of Washington.

There are sixteen essays by fishery experts from several countries. Seven of the authors are present or past officials of the National Marine Fisheries Service, which is

part of the Department of Commerce's National Oceanic and Atmospheric Administration. The editor is Dr. Brian J. Rothschild, Director of the NMFS Southwest Fisheries Center, La Jolla, California.

Topics explored include: territorial conflicts, the fishery needs and desires of developing countries, conservation standards, and equitable allocation of catches in today's fisheries; the drift from the goal of maximum sustained yield to more complex social-welfare goals; and the necessity of evolving new methods of fishery management through use of systems analyses and computer technology.

This book will be of interest to anyone concerned with the sea, but particularly to the many participants expected at the Conference on "Law of the Sea", sponsored by the United Nations and scheduled to begin later this year.

PUBLICATIONS INDEX

The Pacific Sea Grant Advisory Program (PASGAP) issued a second edition of "Inventory." It cites approximately 200 publications and 250 audio-visual films available from PASGAP Institutions. It provides a convenient, practical reference to non-technical material for a broad audience with general interests.

"Inventory" was compiled by Oregon State University Sea Grant Marine Advisory Program; edited by Vicki Gaffke and Gwil Evans.

It is easy to use. It is divided into: Subject Index; Publications Section; and Audio-Visual Material, alphabetical by title.

Since the PASGAP program is an international consortium of 7 universities and 3 regions of National Marine Fisheries Service (NMFS), there is a wide and helpful selection of material available. With "Inventory", it will be easy to locate. Information offered includes such titles as:

How to Cook Tuna
Continental Shelf Sediment Off Oregon
Oyster Farming--Culturing, Harvesting, & Processing
Bottomfishing Provides a Pleasant Change for Oregon Anglers
Organizing and Operating A Fishery Cooperative, Parts 1 & 2
Ocean Zones and Boundaries: International Law and Oceans

Teachers, scholars, government and industrial workers, and fishermen will find this special aid helpful in locating nontechnical information about marine resources.

"Inventory" is available from the Cooperative Extension Service, Oregon State University, Corvallis, Oregon 97331.

FROZEN FOODS: PROCESSING AND HANDLING

"Recommendations for the Processing and Handling of Frozen Foods," 2nd Edition. Edited by the International Institute of Refrigeration, 177 Boulevard Malesherbes, 75-Paris-17e, France.

This edition records the new knowledge of freezing amassed in the past decade. The new techniques of processing and handling frozen foods are included.

The general principles of freezing and thawing of foodstuffs cover physical aspects, hygiene, packaging, transporting, displaying, retail selling, and nutritional aspects. A complete new section is devoted to quick-freeze products: vegetables, fruits, meats, dairy products, fish, and desserts.

The book is in French and English. There are many charts and tables. 236 pages. Paper bound $9.00.

--Laura Burchard

CRAB LOUIS WINS APPLAUSE

Mrs. Rose Kerr, former Chief of the National Home Economics Research Center in College Park, Maryland, says no list of favorite seafood recipes is complete without Crab Louis.

This famous recipe was originated by the chef at the Olympic Club in Seattle, Washington. The story goes that the first time the famous tenor Enrico Caruso tried Crab Louis, he liked it so well he ate all there was in the restaurant.

The two Louis Dressing recipes given here vary from the original but are equally delicious. One is a simplified version, the other--for calories counters--omits the whipping cream.

Choose your own favorite crabmeat for this entree. Whether it is king, Dungeness, blue, or snow, it will be low in calories and provide high-quality protein, vitamins, and minerals for good nutrition.

LOUIS DRESSING

½ cup mayonnaise or salad dressing

2 tablespoons chili sauce

2 tablespoons chopped green onions

2 tablespoons chopped green pepper

1 hard-cooked egg, chopped

1 tablespoon chopped olives

½ teaspoon lemon juice

Dash salt

Dash pepper

Combine all ingredients and chill. Makes approximately 1 cup dressing.

LOUIS DRESSING

1 cup mayonnaise or salad dressing

3 tablespoons catsup

2 tablespoons chopped sweet pickle

1 tablespoon lemon juice

Combine all ingredients and chill. Makes approximately 1 cup dressing.

CRAB LOUIS

1 pound crabmeat, fresh or frozen
or
3 cans (6½ or 7½ ounces each) crabmeat

1 head lettuce

½ teaspoon salt

1 cucumber, sliced

4 tomatoes, sliced

3 hard-cooked eggs, sliced

Louis Dressing

Thaw crabmeat, if frozen; drain. Remove any remaining shell or cartilage, being careful not to break the crabmeat into small pieces. Shred lettuce and place in a large shallow salad bowl. Sprinkle with salt. Arrange the crabmeat over the lettuce. Place alternate slices of cucumbers, tomatoes, and eggs around edge of bowl. Spread Louis Dressing over the crabmeat. Makes 6 servings.

(Source: NMFS, NOAA, U.S. Department of Commerce, 100 East Ohio St., Room 526, Chicago, Ill. 60611.)

FOOD FISH FACTS

SABLEFISH
(Anoplopoma fimbria)

The fishery for sablefish is one of the oldest along the Pacific coast. Beginning in the 1890's off the coasts of Washington and British Columbia, the fishery later expanded to Alaska, California, and Oregon. During World War I the fishery was stimulated by the demands for more fishery products, and again during World War II by the need for a natural source of vitamin A.

DESCRIPTION

Sablefish are known by several other names, the most common being black cod. This name is misleading, however, since the sablefish is not a true cod but a member of the skillfish family. This family, which contains sablefish and skillfish, is noted for a lack of ridges or spines on the head, two well-developed nostrils on each side, and single lateral lines on the bodies. Sablefish are streamlined fish, having rather compressed bodies with wide separation of the dorsal fins, some spines on the fins, and slender tail sections. They are a slaty black to greenish color on the top surface, shading to lighter gray on the belly. Sablefish, however, is around 30 inches long and about 8 pounds.

HABITAT

Sablefish range from the Bering Sea to California. They are found over a wide range of depths from intertidal waters to depths of over 600 fathoms. Alaskan and Washington waters account for about $\frac{2}{3}$ of the annual catch of approximately 7 million pounds. The port landings, however, do not necessarily indicate the origin of the catch.

Sablefish are a bottom-dwelling fish and they seem to prefer a soft rather than a rocky bottom. During the winter spawning period, adult sablefish are found at greater depths than at other times of year.

USES OF SABLEFISH

Almost the entire catch of sablefish is dressed, frozen, and taken to fish curing plants for preparation into a smoked product. Smoked sablefish have long been considered a delicacy and there is an increasing demand for them. These fish are particularly suited to smoking because of their moderately high fat content, and mild, delicate flavor. The smoked product is usually sold in chunks and is available at seafood markets, supermarkets, or delicatessens across the land. It is generally in good supply and is moderately priced. It is ready to eat after the smoking process or it can be steamed, or used in casseroles or salads. (Source: National Marketing Services Office, NMFS, U.S. Department of Commerce, 100 East Ohio Street, Rm. 526, Chicago, Ill. 60611.)

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